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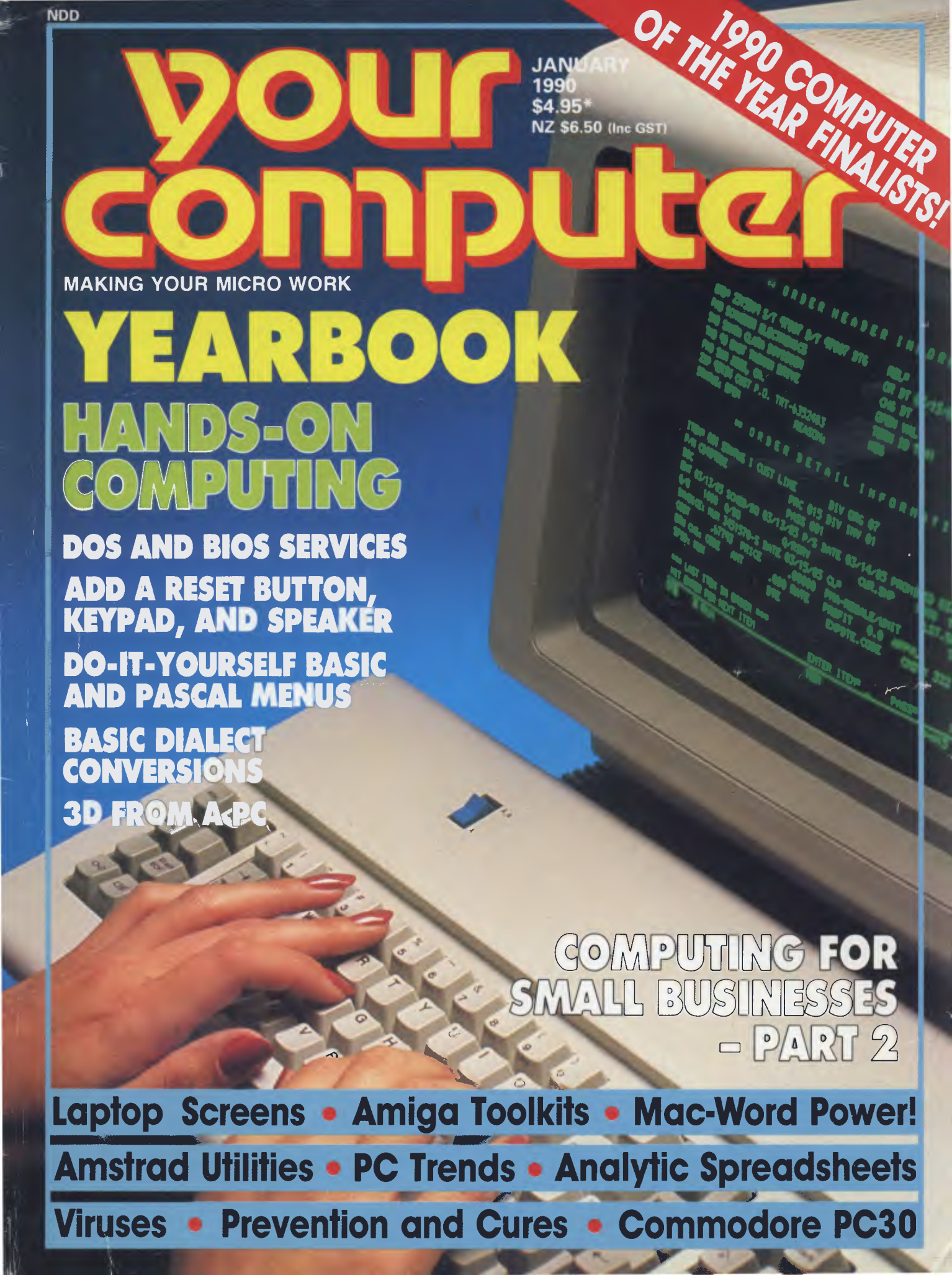

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PC OF THE YEAR AWARDS 26

NEXT MONTH INCLUDES

The 1990 Personal Computer of the Year – the last 12 months have seen the release of the most innovative PCs we've seen since 1982: which way does the future lie? Amongst those releases was a flurry of portables – our annual survey highlights the advances in the last 12 months and will let you match the right configuration to your needs. Speaking of needs – an often neglected need for every user is security (as the recent virus hoopla brought home to many), whether you work alone with twin floppy drives or are part of a national network; PC Security will bring you up-to-date.

This month's cover: Concept by Sally-Anne Silveira; photograph by Jay Fries, The Image Bank; and cover lines by Jake Kennedy.

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JAKE KENNEDY

Happy new era!

ONE OF THE MOST interesting facets of my work with *YC* is talking to users on just about every walk of business – from managing directors who never put their hands on a keyboard, but depend heavily on PCs for the office monkey-work and management reports, to self-employed professionals and tradesmen who are intimately acquainted with their machine and its capabilities.

Recently, as part of the quest for Finalists in our PC of the Year Awards, I spoke with a number of them and discovered something quite remarkable – regardless of the type of business or its size, all of them are developing similar attitudes which can be summed up with a single word: global.

Now, there are two edges to that word: one carries the sense of 'world-wide' and the other 'as a whole' – the first describes external relationships of the business and the second, the internal; but, both of them have their foundation in a single concept – sometimes it's referred to as 'information processing', sometimes as 'data processing', but the concept is the same.

A natural development

I DON'T PRETEND that computers were the cause of this – it's more basic than that. It's a natural development of improved communications: our big world has gotten smaller, while our little worlds have gotten bigger. But, it's apparent that, in the computer world, we are starting to think in holistic terms, just like Douglas Adams' Dirk Gently. The growing capabilities of computers and the maturation of software is giving us the tool to develop that.

The exciting part is that almost everyone now has the opportunity to work with that same 'tool' no matter the size of the business. Whether you are running a single-employee business or one with a far-flung network of offices, the machines and software used are often very similar – dBase or 1-2-3 or WordStar are just as effective, and just as useful, in each situation.

For some time we've been following the blurring line between minis and PCs – with the latest crop of releases, led by Compaq, Unysis and Apricot, it's apparent that the line will soon be gone. But more interesting is the effect the new generation of software will have: the differences between 'small' and 'big' business are going to blur when all have the same powerful, friendly and flexible programs to work.

To that, we say: *Happy new era!* □

January 1983

There is nothing new about the hardware of the IBM PC. In fact, by modern standards, it is quite old-fashioned – ***Les Bell, 'IBM Moves In', p17.***

Marketing microcomputers has become more competitive and more complex over the years – so much so that today's customer is more often than not totally confused by the dazzling characteristics of the latest machine to hit the market – ***John Hall and John Skaller, 'The Big Sell of Little IBM'.***

Unix is not the be-all and end-all of Operating Systems, but it is the only reasonable choice for a 16-bit machine – ***Bill Bolton, 'Unix against CP/M', p59.***

Future Features

IN ADDITION to our application stories and other informative pieces, each month we present features designed to keep you informed about the world of personal computing –

March 1990

Printers – Part 1: Choosing a printer is a matter of balancing speed, quality and price – our survey of laser and dot matrix printers will help you match a machine with your needs and take part in the latest trend: distributed printing.

April 1990

Printers – Part 2: If you need to print out color graphics, and presentation quality is important, then don't miss our feature on inkjet and thermal printers (and color lasers).

May 1990

Add-on Atlas: Turn your machine into a dream machine for productivity with a '386 motherboard, 16Mb of RAM, dual color monitors, 300Mb ESDI hard disk, a fax/modem, video digitiser and voice recognition.

June 1990

Unix and PCs: The rapidly increasing power of hardware has made a PC-based system a real alternative to minicomputers for sites with a number of on-line users – and 21-year-old Unix has come of age, offering an alternative and adjunct to other multiuser operating systems.

July 1990

Desktop Presentation: Desktop publishing, computer-based videos, presentation graphics, scanners ... the tools now available to all businesses enable them to make effective, low-cost presentations with a professional cast.

August 1990

Monitors: Whether you want to upgrade your PC or Mac monitor to color, add a VGA card or find a monitor to use with your portable or new system, our survey will bring your choice into focus.

Application stories – particularly those with the same theme as our features – are always welcome. Please address editorial enquiries on our features to Mark Cheeseman, (02) 693 6143, and advertising enquiries to Mark Wilde, (02) 693 6646.

HOWARD KARTEN

Specialty software

I DECIDED TO take an inventory as my software seemed to be proliferating. An interesting-looking experimental package I recently purchased, was projecting that at my current usage rate, I'd fill up my 20Mb hard disk very soon. It turns out I've got more unusual software than I had realised. It almost seems, that the more I've acquired, the more I stick to the old tried-and-true software. In any event, the specialty software I use the most tends to be the programs which do simple functions, such as post-processing of text files in some special way, database repair functions, or routines to customise my output for *YC*.

A good item of specialty software, properly used, will show you things you never knew about your computer.

In short, these thoughts led my mind to wander (it takes very little to do that, actually) to the subject of specialty software, and I had several realisations about it. At one point, I'd added a TSR (pop-up, hot-key) program to my AUTOEXEC.BAT, and a few days later, I discovered two things – an odd-ball utility I ran once in a while seemed to be taking longer to run, and a subdirectory I had thought was unused was growing larger. Only after thorough backtracking did I trace it to the installation of the TSR. It turned out that the TSR was maintaining some sort of large index there, as a workfile.

Years ago, as a mainframe programmer, I always issued a cautionary memo to all users whenever I did a new sysgen. (Sysgen is the process that produces the ultimate specialty software – an operating system. It's a little like going from Dos 3.3 to Dos 4 on a PC – except that it's much more individualised.) I realised I should have done that with the TSR, and then I could have written myself another Post-It note to add to the collection previously pasted on the plastic bordering my CRT. (Now *there's* a specialty item the computer world *really* needs – a plastic thing-a-majig to fit around the CRT and add more space for Post-It notes!)

The whole incident was a pain in the anatomy. This made me realise that in many respects, specialty software parallels the situation with medical practitioners. If you've got a dull, achey pain in the giblets, say, why waste time with a general practitioner when you can go right to an expert specialising in dull, achey pain in that area?

One understands, of course, that the specialist has higher fees than the GP, and that it's more difficult to get an appointment, and the ancillary costs are higher as well. After all, the specialist has special study and training, knows all the arcane diseases, and perhaps can bring about a cure sooner.

Similarly, many buyers decide to bypass 'ordinary' general-purpose packages on the theory that a piece of specialty software is more powerful, and eventually, they'll wind up migrating to it anyway, so why fool around with the less powerful stuff?

Vendors have a tiny reason to encourage that kind of thinking. Actually, it's so small and silly I almost hesitate to mention it – as more and more 'plain vanilla' software becomes available, competition inevitably forces the price down, which means smaller profits for vendors, and thus they have to find something unique to help sell their products, which means they turn to 'specialisation'.

I don't necessarily suggest this attitude is wrong. You know me – would I be suspicious of anything a vendor says? Naaaaaah. In some cases, specialty software definitely *is* called for, and is well worth the extra costs it will impose.

In any case, this reminded me of Karten's Law of Specialty Software. Briefly, it is this – the more specialised a piece of software is, compared to the 'standard' or base category in which it belongs, the more expensive it will be. I think this reflects some kind of basic law of economic (that is, human) behavior.

It helps, too, to remember the Law of the Hammer – to the individual with a hammer, everything looks like a nail. In other words, although specialty software may indeed be able to solve your problem, it may be overkill, too. And if that's the case, the extra cost of the software itself may be only the tip of the iceberg. There may be as well what I call a productivity paradox.

I have seen cases where someone took ordinary database software, applied labels to fields to make them look specialised, and tried to pass them off as 'written specifically for your *industry.'*

The productivity paradox is that there will probably be a premium on learning how to put the software through its paces – and the extra learning time (occasioned by the richer range of features) may not be gained back in using the software.

Attention to detail

ANOTHER ASPECT to consider is value. I have seen one or two cases where someone took perfectly ordinary database software, applied labels to fields and reports to make them look specialised, and tried to pass them off as 'written specifically for *your* industry.' And it's true – a package I saw for dry cleaners, for example, contained fields for 'delay in picking up item', 'garment color' and 'skirt length'. By mak-

ing up the field names in advance, the individual who'd done the customisation had made it look like it truly was 'specialty software.'

That kind of attention to detail at first impressed the prospective buyer – until he remembered that he didn't keep that information now and had no need to keep it in the future. So, it's well to cast a wary eye on just what it is that makes a package 'special', and be certain the benefits are worth the cost.

An additional cost of specialty software is the mental 'shelf space' needed to use it. Any regular computer user knows that there are only so many commands you can keep in your head, and for the rest, you have to refer to the manual. Specialty software almost always means 'special functions', which in turn requires that you remember all the keys to do those special things.

I'm not suggesting anything negative about specialty software. Far from it. Specialty software really is an 'expander' because it expands your mind, your productivity, and indeed, it expands your universe. A good item of specialty software, properly used, will show you things you never knew about your computer, your data, or your software.

The caution with specialty software is that if you choose indiscriminately – and it's perilously easy to do that – you may get disgusted with 'specialty software' and miss out on the excellent stuff that's out there. The art is at least half in the choosing, so don't be too quick to go for a piece of specialty software just because someone claims it's been 'customised.' On the other hand, don't reject it out of hand, either – every day, inventive, ingenious, and just plain stubborn tinkerers come up with new wrinkles.

Some people are just naturally attracted to specialty software. My hunch is that these are probably the same folks who are attracted to new things on the market and 'gadgets.' Marketeers know and love these folks. They're called 'early adopters' in marketing lingo, and they're drawn irresistibly to new or specialty items – but these folks put it aside with the same regularity to go on to still newer items. Some of them are veritable walking catalogs of specialty software – they've tried it all. These are good folks to become friendly with, if you want a good source of stuff to play with.

By some curious process I'll never understand, I learned about a company making a new product, which used artificial intelligence, heuristics, and other techniques I'd never even heard of, to keep the disk organised and optimised. I called the company's toll-free number (the called party pays the tolls), and a nice customer-service rep listened sympathetically as I explained my need.

I'm not suggesting anything negative about specialty software. Far from it. Specialty software really is an 'expander' because it expands your mind and productivity.

'Oh,' she said, 'we have just the utility program for you. It forces you to be more neat and organised, helps you remember changes that may affect things afterwards, and saves people lots of time every month!

'You install it on your hard disk and forget it. It monitors any changes you make that could potentially have unforeseen effects. If anything unusual happens, it will automatically pop-up and help you determine if any recent changes could be causing the problem. Once you learn all about it – that shouldn't take more than a day or so – you never have to worry about it again. It costs about the same as a night on the town for two.'

Next time I get the urge to take inventory, I think I'll call my internist. Maybe he has something special that will make the urge pass. □


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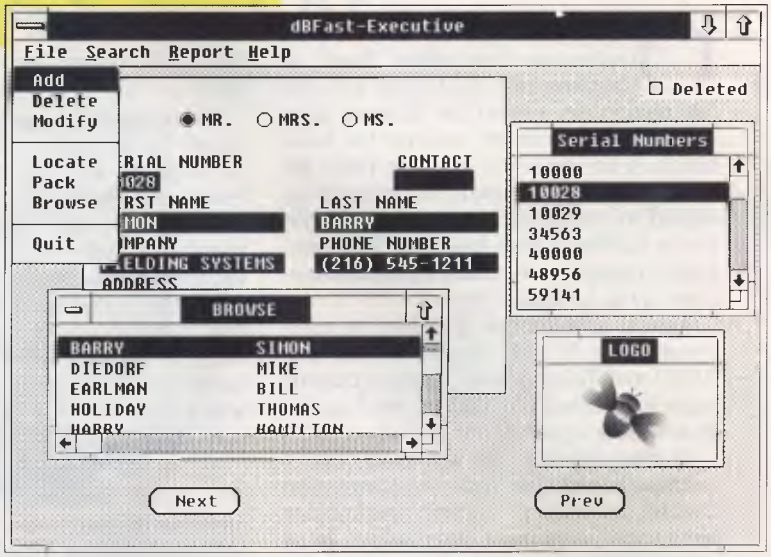

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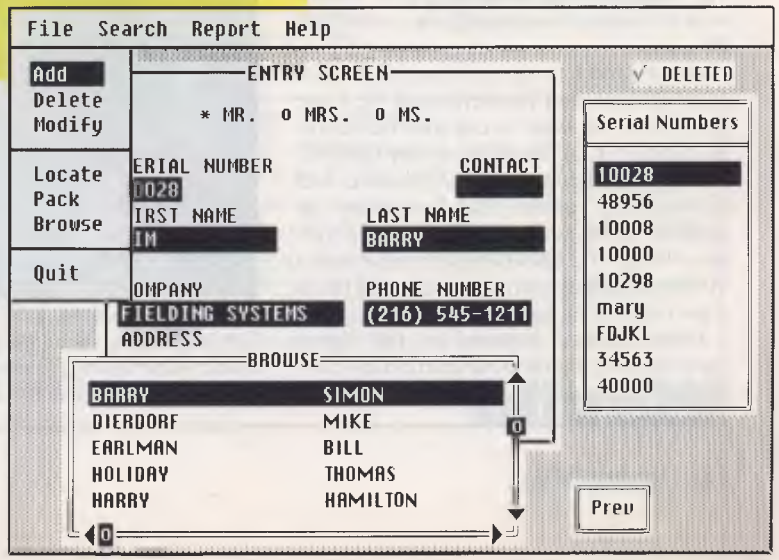

dBFast/PLUS System Requirements

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WILLIAM OLSON

AUSCOM '89

OVER 100 COMPUTER and related technology companies were in Canberra recently for the Auscom '89 technology exhibition. Richard May, director of Auscom '89, believes the exhibition is an important meeting place for business and government departments involved in computer technology. And because Canberra now has over 500 computer companies, it makes sense for Auscom '89 to be based there.

Annual government spending on computers now exceeds two billion dollars. Additional Telecom and Defence Department investment lifts that to over four billion dollars a year of our money.

Staging Auscom '89 was made easier because of the new National Convention Centre. Previously Canberra technology exhibitions were most often held in large agricultural sheds on the fringe of the city at the Showground. The exhibition opened with a corporate profiles day. This covered topics such as computer networking and optical archiving from IBM and electronic printing from Rank Xerox. Microsoft held an afternoon session on connectivity and compatibility.

IBM featured the RT Risc-based computer, which is a 32-bit Unix system capable of high grade graphics presentation. Terry O'Connell, IBM's mid-range product marketing manager, said the RT is used in industry for factory process control and CAD/CAM applications. 'There are scientists and engineers who need the RT's power and speed to perform computer intensive applications. Companies in banking, stockbroking, local councils, television and even the art world are committed RT users.'

Wang products demonstrated at Auscom '89 included Freestyle and PC LAN. Freestyle is an easy to use interface communication tool. Working on any '286 PC, Freestyle allows questions, comments and instructions, either hand written or spoken, to be added to files on the system. Wang's PC LAN is based on Banyan's Vines network operating system and has a wide networking capability.

Unix was also featured on the Sigma Data display. Sigma Data distributes Convergent Technologies workstations in Australia with over 40,000 now installed. More than half of these are in Government offices.

The Interface Technology stand concentrated on storage of text graphics and photographs with its Spot, OAS, Picture Power and PowerLan system. Spot is an intelligent optical character recognition translator. Keith Wolfson from Interface Technology claims Spot reads at up to 25 characters a second with almost 100 per cent accuracy. Spot copes with a wide range of fonts. Picture Power allows PC users to load pictures into databases where they can be edited, displayed with text or printed out on business stationery.

Zenith had a new laptop on show, the TurboSport 386 with a 40Mb hard drive and a white page screen display. The TurboSport keyboard detaches for easier use. Also available is the lightweight SuperSport 286 with an extended battery life. The SuperSport features a zero wait state, a high resolution screen and a 40- or 20-Mb hard drive. The company also demonstrated a new flat color monitor.

Canon, makers of 80 per cent of the internal engines in laser printers, had their new LBPIII laser printer working at their display. It has nine scalable fonts ranging in size from 4 point up to 254 point with rotating, shading and reversing all possible. The machine has 1.5Mb of memory with expansion cards available.

Australian Design Award winner, Intouch Tutorials from Perth, showed the latest versions of their software education packages. Phil Brockbank from Intouch said that many companies still pay big fees to send their staff away on courses. 'Not only is this extremely expensive and time consuming, if the trained employee leaves, your investment walks out the door'.

With Intouch Tutorials, an organisation can train all staff in-house which minimises business disruptions. The tutorials work out at less than a quarter of the cost for regular training, and allows people to go at their own learning pace. A unique feature of the tutorials is windowing – this displays tutorials on screen together with the software package being learnt.

Government assets

KEEPING TRACK OF purchases is a major headache for federal government departments. All plant and equipment must be kept on an asset register until written off or sold. Many used government items are auctioned or sold by tender.

Canberra's new National Convention Centre, combined with the Capital Park Royal Hotel, made visiting Auscom '89 a simple arrangement, although there were complaints from exhibitors about the lack of air conditioning inside the new centre.

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* Data on the world-wide Information Systems industry compiled by Datamation shows that Olivetti revenue in 1988 was more than Amstrad, Commodore, Compaq and Epson combined.

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Animatronics' representative to Auscom at Gestetner's stand.

A Canberra software company, Intelligent Applications, has designed Assetpac for keeping exact details on government purchases. Phil Roger, from Intelligent Applications, says that up until now there was no suitable software for government purchases and asset control. 'Our system has aroused a lot of interest from federal government departments, and in fact, we have won a contract with the foreign affairs department for a complete system.' Because foreign affairs has its assets scattered around the world in various embassies and offices, the Assetpac system will solve their asset tracking problems. The defence department is also keen to give Assetpac a trial.

Assetpac is divided into three software packages. One keeps track of purchasing while a second controls existing assets and a third checks on the location of all assets. 'The three packages may be linked so that data flows across from one package to the next or they can be used separately.'

Another software package from Intelligent Applications uses bar-coding for point of sale data, and gives easy stock control to any organisation with cash sales. 'Government departments with over the counter sales such as books, reports and publications will find FAPAC useful.' FAPAC, standing for Fixed Asset Control Package, tracks all assets from acquisition to disposal. Also individual assets can be linked for easy manipulation. FAPAC also includes a depreciation schedule, and can deal with thousands of items.

Touch me

COMPUTER ILLITERATE senior officials in the department of community services and health are causing havoc with some of their recent spending decisions. One decision called for all staff to learn touch typing. Despite the number of self-paced learn to type packages available for PCs, the training department was told to buy 16 Adler electric typewriters. Two instructors were then contracted from the local TAFE to run a six month course on touch typing.

While there is nothing wrong with the TAFE instruction, the department no longer has any typing pools. All of their administration is on screen. Also, the Adler typewriters are designed for experienced touch typists because the daisy wheel lags behind the keyboard.

These same executives supposedly became excited when watching the recent spate of Macintosh ads on TV. Although the ads show genuine Mac features, the health and community services executives thought that everyone should have a Mac on their desk because it would do all those things it did on TV in the same 30 seconds it took to run the commercial! □

THE SMALL BUSINESS ON COMPUTING

PART 2

Small businesses can effectively use PCs to reach their goals – but there's more to it than accounting.

IN PART I OF 'THE Small Business on Computing' (December '89), we discussed evaluating the need for a computer, and basic accounting software and concepts. Like any other part of the business, the computer system, its software and peripherals need to be chosen to help the business realise its goal. And, the point was made that to be successful, every business must have a goal – without a clearly defined *reason* for the business, any decision making tends to be based on 'gut feeling' rather than reasoning. And, as the cliche has it, 'that's no way to run a business.'

Most small businesses introducing a computer system for the first time will find that a combination of the basic accounting modules discussed in December will suffice, at least for the first several years. (Any purchases should be made on the basis of anticipated needs at least twelve months in the future – if it's possible to plan in detail three to five years into the future, that's great, but most businesses aren't so lucky).

The typical reason that most businesses have for first considering a computer, is to make accounting quicker, easier and as close

LOU JONES/THE IMAGE BANK

to error-free as possible. So, we will look at accounting type packages in more detail before moving on to speciality packages.

Before visiting dealers and looking at software, a list of accounting needs should be drawn up. It should be as detailed as you can make it and tailored to meet your goals for several years in the future; it should also be tailored to match the company's available resources. Any business has a number of different 'resources' available to it and these need to be taken into account when making any plans. The most obvious resource is the money to make the purchase, but others include the intended users and office space. Productivity with many small computer systems is hampered simply because there isn't enough space allowed to set them up for convenient use – how can any one expect error-free input when the accounts staff have to hold the invoices for keying-in on their lap?

Training

IF YOUR 'INTENDED user' is shy of computers ('Don't bring that damned contraption near me!'), that's a problem that needs to be addressed very early in the piece, either through training or more drastic methods. Training can be very expensive, and the longer it takes to reach proficiency, the more expensive it becomes. If you

Many businesses make the mistake of investing tens of thousands of dollars in a computer system and software and then leave inexperienced operators to find their own way. Formal training, especially if the operator is sent on a two or three day course, may seem expensive at first glance, but it makes the difference between realising the potential of the investment quickly and wasting it.

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Like any other part of the business, the computer system, its software and peripherals need to be chosen to help the business realise its goal – and the most basic of goals is profitability. The cost of any system must be balanced against expected increases in productivity and 'the bottom line.'

(or your 'intended') are completely computer illiterate, then some form of formal training is necessary. It's quite possible to go to a dealer and bring back a PC complete with software ready to run in a morning, but it can then take six months to figure out (or discover by accident) how to do all those things the box promised. That's clearly a waste of time – even someone who has never used a computer before should be able to become relatively proficient with basic accounting software within several weeks. But, that takes more than a five minute run through with the salesperson.

This training can be achieved in one of two ways: either at your premises or at the trainer's. At first glance, the first seems the most attractive, but bringing a trainer in for a day or more (depending on the package) works out more expensive and less effective than sending the employee to a course – on a course, learners will be uninterrupted by the boss or telephone and can concentrate on the job at hand; also, the dynamics of a course with half a dozen others from a variety of businesses, ensures that attendees quickly gain a broad background to the software and will learn of features the trainer might not have thought to demonstrate otherwise.

Many basic packages are simple enough to be self-teaching, particularly if they are clearly written, logical and indexed (that's an absolute necessity to avoid a lot of frustration) and a good online help system. But before anyone can take advantage of that help, they need to know at least the computer basics – the best place to learn where such training can be had locally, is to check the computer/high technology section of your state capital's major newspapers, or the *Yellow Pages*. It's advisable to undertake this training before even thinking about which computer or software to buy. If you are the 'intended', this background is essential to any decisions; if it's someone else, then the sooner they start learning, the better – this also adds another 'resource' to your business: a second opinion and one with an accounting bent.

Once the basics have been mastered, it's time to do some shopping, armed with a detailed list of needs. In drawing up a list for an accounting package, you need to consider a number of 'how manys': How many customers do we have . . . stock and catalog lines do we handle . . . characters in the product codes used . . . ledger accounts are there . . . ledger entries are made each year . . . users to the system will there be . . . invoices and statements are mailed out each month . . . separate ledgers need to be kept . . . cash sales per month . . . and, how many letters do we write each month? As you think about these, others more specific to the business will occur to you.

You may discover that a basic package can't meet your needs. If that's the case, first re-evaluate those needs in light of what's been learned while shopping around – if your business' work practices can be made to fit one of the packages without major changes (and it is otherwise suitable), that's fine, but you may find that the flexibility required isn't easily available, or it's impossible to get the detailed reports you want for management, or none of them can handle all of your 'how manys'.

NewViews

IF NONE OF those basics can be easily tailored to suit, it's time to look at several of the more powerful accounting packages around. Even if you later decide to use one of the lesser packages, the experience will be valuable. One of the more interesting of the full-featured packages about is NewViews. Priced at $1795, it's worth having on your 'must look' list because it combines the structure and control of a powerful accounting package with the flexibility of a spreadsheet. (NewViews was reviewed in our May issue; if you'd like to know more about spreadsheet flexibility, see 'Analytical Spreadsheets' in this issue.)

The package works as if it were a series of 'nested' spreadsheets. That is, each cell of the spreadsheet can contain the results of a spreadsheet lower down in the nest. These are all automatically linked, so that a change to one causes the appropriate balances lower in the nest to be amended. This type of feature is now becoming common in spreadsheets, but spreadsheet packages do not usually offer the accounting features that NewViews does (and *vice versa*).

The software allows users to create their own, custom modules and subledgers as required. It offers a full audit trail of all deleted or changed transactions and, for security, it has password protection and three levels of editing privilege. Up to ten years' history

In today's rapidly changing property market, real estate firms face a real challenge when trying to keep their sales staff informed of changes to the property portfolio. As Elemer Gombas of Portjiles Systems noted: 'In a typical office, changes are passed on by word of mouth or scribbled on index cards. Invariably, not every member of the sales force gets the information at the same time and this leads to confusion and a tarnishing of the company's professional image.'

Just Costing

WRITING NEW SOFTWARE packages for the speciality market is not everyone's idea of making a living but for those who undertake such a challenge, the rewards can be handsome (and not necessarily financial). When Paul Taylor, managing director of his own management accounting and software development company, started to write a new bill of materials and production costing package he soon discovered the range of problems to be faced before it would be possible to reap those rewards, however.

Everything from the agony of non-recognition from potential users and other industry members, to maintaining a true industry standard software architecture, and keeping himself fed, were all worries he hadn't anticipated. Australia's very competitive marketplace for software was also of primary concern – even before the first lines of code were written.

Taylor started to develop his idea by analysing how well other packages sold and where a certain amount of expertise might have been used to 'enhance' some well-know packages that were being used in the market he was going to approach. The style of the software and how it could fit into a niche market and provide a cost-effective, powerful, and flexible business solution also needed to be considered before he could start to write the program.

While doing his research, Taylor found that no one was providing a simple, easy to use costing package for industry – and this was the niche he chose to address. While the software was written for standalone use, it still had to align with the prerequisites of well-known accounting packages.

After almost eighteen months – during which all profits from his consultantcy were used in development – a working version of the program was given to a client for criticism, and then test after test was performed. As a result, the product code search facility and window responding feature were re-written.

The completed package – Just Costing – then required a manual and it needed to be simple to use, easy to read and follow. This was produced and some client feedback resulted in extra enhancements, which were deferred to later versions to ensure the product was ready for the scheduled release. The next stage was marketing. An initial direct mail shot covered some 3000 manufacturers. Demonstration copies of the software were sent out free of charge at this point, and after a healthy response from new clients, another version of Just Costing package was issued, complete with re-written manual.

Additional direct mail shots were made after follow up of the first mail-out, and a small advertising campaign was mounted in relevant trade publications. Press releases were issued on the new product with its benefits highlighted and the launch of the Just Costing was complete.

Taylor also made contact with many major accounting bodies and accounting software distributors to obtain feedback on the product. The result was a market alignment with accounting software house Attache, and IBM. When asked his plans for Just Costing, Taylor replied: 'The attitude that you have to adopt to ensure your software makes the right kind of waves in such a competitive market is 'look after your customer, even when you are losing money!' If you are serious about your product and determined to keep contented customers, you have to remain extremely considerate to their on-going requirements. Service and client support is a most demanding aspect of the software market if you are going to be successful.'

That attitude is paying off – the CSIRO and BHP have both recently indicated interest in Just Costing.

Paul Taylor began his working life as an accountant in the UK and gained expertise in heavy industrial areas working in stock control accounting procedures, operations planning and production control. He rose to the position of chief accountant for GEC's Foundries Division, before emigrating to Australia and starting his own business as a management accountant and systems consultant. The company installed accounting systems for a wide variety of businesses, including vegetable processing plants, motor auctions, insurance brokers, and various manufacturing companies.

can be kept in the system and reported on – this feature is found in few other packages. Comprop also have a number of add-ons for NewViews; these range from a simple menu system to a time billing facility. The distributor offers hot-line technical support and, we understand that training is available in all state capitals – there are two, two-day courses offered, each costing around $500.

Disadvantages? It's not cheap so you need to be able to justify the investment: as well as the price for the package itself, you will need at least an AT to take full advantage of it – while it will run on a standard XT with Dos 2.1 and 512K of RAM, your operator will find it quite slow if a nest of spreadsheets needs to be updated. Balancing the power of the hardware against the power of the software is a common quandary – where (or if) you compromise needs to be viewed in the light of your original list of requirements.

Not only do the more powerful packages like NewViews require a greater monetary investment, they also need a greater investment in training. But this is necessary if you are going to quickly reap the benefits of the software. There are any number of software training companies about – the first place to ask is the

Elemer Gombas, developer of the real estate office management software R.E. Sales, noted that, 'Many firms are moving away from the shotgun approach of impersonal letter drops, so we included a word processor integrated into the package. It can merge fields from any of the databases in the system and automatically generate mailing labels.'

dealer for the package you are interested in. Two of the better known firms that specialise in this field are Integrated Business (IB) and Infolink. IB offers training in most of the 'big' packages, from Ability to WordStar; there is also an Introduction to PCs course. Costs start from $210 for a one-day course and training can either be at your premises or theirs.

Infolink has taken a different approach to teaching – its award-winning In-Touch tutorials are on video. This means that users can run the tutorial at their own pace, or as time allows. The advantage, of course, is that the video stays in the office ready to train the next new operator or to be used as a refresher. The range of courses the company offers is outstanding – it's worth asking for their catalog to have as a reference for when you are ready to move on to more complex software.

Which of these two approaches is best for your business is probably best assessed by taking the computer literacy of the intended user into account: new users will learn more quickly with an instructor to guide them, while the more accomplished will find the video more than satisfactory.

So far we've concentrated on accounting, but there's more to business than ledgers. One industry that has found computers invaluable for simplifying day to day task and reducing the burden of paperwork is real estate. As well as handling accounting functions, such systems ensure that all sales and office personnel have the same, up-to-date information available to them on all listings.

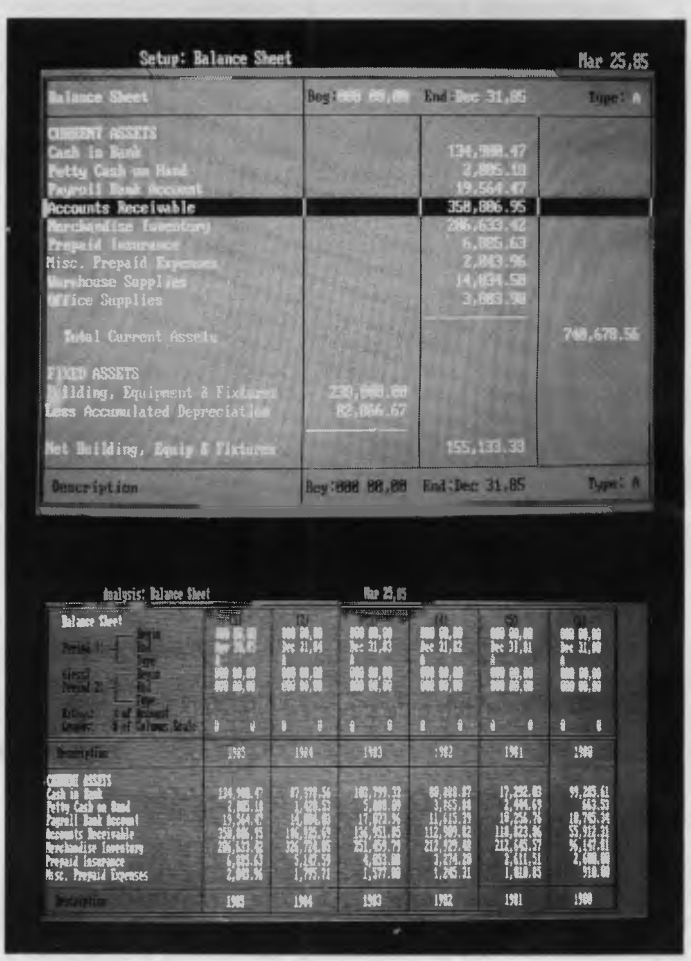
R.E. Sales

MELBOURNE-BASED PORTJILE Systems has developed a real estate office management package aimed at those who haven't used a computer before. Not only does the software provide up-to-the-minute listing information and automatically calculate commissions, it keeps track of rental properties and valuations and stores data on buyers and prospects, other vendors, and gives detailed reports on sales force performance.

In its $1400 price, R.E. Sales includes an integrated word processor that can accept data directly from any of the databases maintained by the firm, giving the opportunity to generate highly personalised letters. To make things even easier, an optional database automatically enters the post code and state when the name of a town is entered.

Reports available with the system include outstanding advertising amounts, assigned company auctions, current auctions, and sold properties. The sold properties report is very useful when dealing with commercial properties – it lists the suburb, purchase date, land size and the price per square foot. Commission reports can include outright commissions, bonuses, and commissions for canvassers.

The package's strength, of course, is in portfolio management. A bonus for having the entire portfolio on computer is 'that if a potential buyer walks in and asks what is on the books, the agent can call up on screen only those houses which meet the client's requirements,' explained the package's developer, Elemer Gombas. As well as streamlining a company's paperwork flow, this is



NewViews is an unusual accounting package – it combines the structure and control of a powerful accounting package with the flexibility of a spreadsheet.

the type of benefit – increased quality in customer service – that often makes a computer system an easily justifiable investment.

Point-of-sales

BUSINESSES WITH a large volume of over the counter sales have a set of accounting problems of their own. Aside from the cash handling, other major challenges are maintaining accurate stock control and sales records. A conventional system with a PC and accounting software is just too cumbersome to use when there's a queue of customer's waiting to be served. To counter these problems, a number of 'point-of-sales' systems have been developed.

Typical of these is Sanyo Office Machines' POS System. Sydney Aquarium installed one of the systems in their gift shop – it comprises two cash register/terminals in the shop which are connected to a PC with a 20Mb hard disk in the accounts department. With the high volume of visitors to the Aquarium – over 1.2 million are expected this year – accurate and current inventory control and sales reports would require full-time dedicated staff, and even then, because of the manual processing required, reports would be out of date.

The shop stocks some 5000 products, priced from $0.50 to $400 – stock records, cash reconciliations and sales reports are all generated automatically and are as current as practically possible. Jane Moore, office manager for the Aquarium, noted that the system's ability to list the top 50 selling products lines was a very useful management tool: 'It is very helpful in getting an accurate picture of the shop's operation at a glance.'

A similar system has been installed at Sydney's Powerhouse Museum. There the inventory problem was even more complex. The Museum's retail manager said that, 'Unlike most multi-outlet retail stores, which sell the same items in every location, we sell four completely separate ranges. With about 4500 items sold through the four outlets, it was very important that we keep an eye on stock levels and how specific items performed in specific outlets.'

To the basic system, the Museum added Sanyo's PLU (Price Look-Up) facility. 'In choosing our system, an important consideration was the ability to look-up prices on up to 3000 lines on each cash register.' The PLU can actually handle 10000 items and Sanyo market a number of other modules ranging from general accounting to production planning and letter writing.

Similar systems have proven themselves useful in almost every field of business from golf pro shops, clothing stores, bottle shops and giant retail chains. If your business has a large number of cash sales on an extensive, low-priced line of products, a point-of-sale system is definitely worth investigating.

As you can see, there is probably a computer system tailored for your particular field of endeavor – and there is more benefit to be had than streamlined accounting. Every part of a business must be developed to allow precisely defined goals to be reached, and a computer system can remove much of the necessary drudgery of running a business so that more time can be invested in service, development and customer relations. With properly selected software, users can have access to timely reports on any part of the business – and that's a solid basis to good management. □

Many small businesses are cash register oriented and this gives them a set of accounting problems all of their own – cash handling, bank reconciliations, keeping prices up to date, maintaining accurate stock control and sales records are all tasks which take on a new dimension.

We mentioned . . .

IB Courses
Integrated Business System,
Level 2, 38 President Ave, Caringbah 2229 NSW
Phn: (02) 526 2455; Fax: (02) 524 3568

In-Touch Tutorials
Infolink Group,
55 Lavender St, Milsons Pt 2061 NSW
Phn: (02) 969 5679; Fax: (02) 929 7615

Just Costing
Paul Taylor and Co,
Level 1, 8 Palmer Street, Parramatta 2150 NSW
Phn: (02) 683 6066

NewViews
Comprop Pty Ltd,
Level 21, 10 Eagle St, Brisbane 4000 Qld
Phn: (07) 232 0454; Fax: (07) 232 0419

POS System
Sanyo Office Machines,
5 Harbourview Crescent, Milsons Pt 2061 NSW
Phn: (02) 929 4644; Fax: (02) 925 0248

R.E. Sales
Portjiles Systems,
1601 Malvern Rd, Glen Iris 3146 Vic.
Phn: (03) 823 4470; Fax: (03) 25 4215

ACCPAC PLUS

THE ACCPAC PLUS system includes a suite of thirteen integrated modules – the core accounting modules plus additional ones, including retail invoicing, job costing, sales analysis and graphic reporting. The publishers, Computer Associates, also offer the Accpac Access library of products written by third-party developers.

For a single user system, Dos 3.1 or OS/2 is needed, plus 512K RAM for the Dos version, or 2Mb for OS/2, and a hard disk with 20 to 40Mb of free space. The Windowing System Manager facilitates a multi-user version – that requires a minimum of 640K RAM and a 100 per cent IBM-compatible network.

Installation is straightforward, even for novices. The tutorial gave an excellent introduction to the package, but didn't cover all menu options – the ACS felt the tutorial should be expanded, particularly to cover the complex area of Inventory. Context sensitive help is available and users can also search the help facility for key-words.

The optional Windowing System Manager provides features for setup, security, printer control, and the ability to switch between modules without exiting the current one, or one module can be opened with several different menu items. The system also provides a macro facility with a 'learn mode' that records keystrokes as a macro. Although optional, it is recommended to obtain the most effective use of the software, and it's required for network use.

The Australian Society of Accountants independently evaluates accounting packages for vendors – as a service to our readers, we will be publishing extracts from their reports as they become available.

Accounts payable and receivable

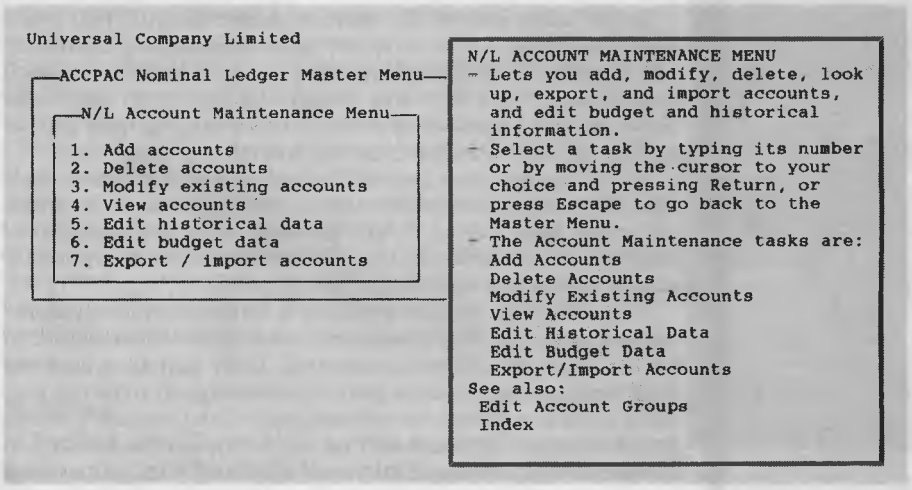
THE ACCOUNTS payable control file allows users to choose integration to the general ledger, job costing, time billing and receivables facilities. Up to five control accounts and five bank accounts are allowed, each with its own general ledger account. 'Hold-back' in payments can be specified – this is a feature that the construction industry will find useful.

Accounts receivable is set up similarly with the addition of a number of alternatives including the ability to include recurring invoice information and order entry fields. Additional options include the selection of fractional quantities, negative inventory levels, five pricing levels, and user-defined costs and codes. The lengthy list of options provides great flexibility, but may be initially confusing to new users.

A cashbook is not included in the core module, but is available through the library mentioned above. While Accounts Payable includes a cheque reconciliation feature, a complete reconciliation cannot be printed out and there is no facility to print deposit slips. A disappointing part of Accpac is its poor treatment of cheque cancellations – canceling a cheque does not replace the invoices paid by it or reverse the entry to the bank account. These steps must be taken with journal entries, but the program's strong error verification procedures and pre-cheque register may help to reduce the number of canceled cheques.

The most common negatives expressed were that the chart of accounts was initially difficult to set up and that the package's compulsory accounts wasted large quantities of paper.

Overall, the ACS found Accpac Plus a full-featured and flexible package suitable for small and medium sized businesses. Users will need to take care when setting up options to get the maximum benefit from the package, however. Documentation is adequate and reports generated by the package are comprehensive and flexible. Strong audit trails are included with each module.



In addition to the 13 modules available with Computer Associates Accpac, the distributor offers a library of third-party add-ons for specific applications.

However, the lack of integration between Accounts Payable and Inventory causes a need to duplicate date entry; some users may find the overall integration between modules cumbersome. Also, there is no facility to print invoices from the Accounts Receivable module, necessitating the purchase of a separate module.

The features most liked by end-users are the export facility and the flexible reporting options. The most common negatives expressed were that the chart of accounts was initially difficult to set up and that the package's compulsory accounts used large amounts of paper.

The distributor offers various levels of support. Upgrades and enhancements are available for $75 per module per maintenance term, and technical telephone support is available for $300 per module per year, with upgrades and enhancements included. □

Product Details

Product: Accpac Plus
Distributor: Sourceware
6 George Pl, Artarmon 2064 NSW
(02) 427 7999
Price: $950 per module
$274 Windowing System Manager

Evaluation copy: supplied by LAN Corp Pty Ltd,
44 Bay St, Ultimo 2007 NSW
(02) 288 0509

Independent evaluations

THE AUSTRALIAN SOCIETY of Accountants (ASA) has launched an independent evaluation service for business information technology products (BITP). Accountants and their employers expect to spend in the vicinity of $800 million on BITP this financial year. The decisions they make will clearly impact on business life in this country.

The ASA aims to assist its members and others in their decision making. To further that aim, the CPA Product Report program has been developed to assist the decision makers to determine the BITP which best meets their requirements. The ASA believes that their CPA Product Reports will help minimise the risk factor in selecting an appropriate system. 'To make the right decisions and provide the right advice, accountants need the right information,' the national president of the ASA, Joe Abraham, noted. 'The product report service was aimed at providing an alternative to expensive consulting services for potential BITP buyers, yet provide information without the vendor hype.'

Each report is written by a panel comprised of a partner in a public practice accounting firm, a computer media representative, managing directors of computer consulting corporations, senior consultants from large accounting firms, and directors of the ASA. The reports include: a comprehensive technical assessment; information on the product's development; opinions from the ASA Approved Dealers; opinions from the product users; and comments from the product's manufacturer.

The introduction of similar services in the past has been hampered by the cost of conducting such an extensive evaluation, typically in the range of $5000 to $10,000. The ASA has overcome this problem by passing the cost onto the manufacturer of the product being reviewed. As a result, the reports are available to interested parties for only $50 per report.

The ASA's director of information technology, Paul Thewlis, commented that, 'We are asking a great deal from the manufacturers when they agree to have their product assessed by our panel. Companies must have substantial confidence in their products to place them under such intensive and public evaluation.'

Synopses of the reports will be published in the Society's journal, *The Australian Accountant*, as they are produced and *Your Computer* will also be publishing a synopsis of selected reports. If you are interested in the ASA's CPA Product Reports, contact the ASA IT department at Accountants House, 170 Queen St, Melbourne 3000 Vic; phn: (03) 606 9606, fax: (03) 670 8901.

PERSONAL COMPUTER OF THE YEAR AWARDS

LAST YEAR WE NOTED that the PC industry was undergoing a period of consolidation – although new processors and architectures were promised, the hardware available to buyers was only a development of the technology that had been with us for several years. In 1989 we saw the first of those promises delivered and almost every player in the PC stakes has announced new machines based on the minicomputer power of Intel's i486 chip. Unfortunately, few of them have been delivered and the gap between 'announced' and 'released' seems to be getting longer.

We often see press releases and articles announcing the wonders of products that will be ready for delivery in 'Q2/90' – that sounds much more definite, more promising, than 'sometime in the second quarter of 1990', but it only helps to distract buyers from the fact that there isn't a machine yet, but there might be sometime in the future. For those who are trying to make serious purchasing decisions, this is distracting and confusing – and damaging to the industry on almost every level.

THE FINALISTS!

At one time if we were invited to a product launch, it was fully expected that it would be possible to put our money down and carry the goods home. That's not so today – we most often find that the *release* of the product is still some time away – the only thing available at the launch is the hype. This approach often gives the marketing people three chances to tout their wares: once at the announcement, again at the launch and then at the release; but it makes it difficult for anyone trying to plan their computing requirements for the future or needing to buy today. Particularly since the credibility of many of the players has suffered over missed release dates.

But, there are i486-based machines actually on the market. The power they offer completely changes the emphasis in the term 'personal computer' – 'personal' in that phrase has been overshadowed by 'computer'. That's the opposite of the first first desktop machines we used – they were much more 'personal' than 'comput-

ers'. These new machines bring the power of high-end minicomputers (and more) to the desktop and are going to lead us into an exciting new era – as soon as the software developers catch up.

When we looked back over last year's hardware Finalists, two things stood out. The first was the diversity of the hardware: a 25MHz '386 from ALR, a Philips AT with CD-ROM drive, a Compaq '286 laptop and XT- and '386-class machines from Toshiba, two refined, small footprint Macintoshes and the 'have your cake and eat it too' Amiga 2500. Each of those represented technological maturity and each of them was crafted for a particular market. But just how fast that market is developing was brought home by the fact that, since then a whole generation of machines – the 33MHz '386s – has been left behind: at the time of last year's announcements the first of these were hitting the market and now, what might have been a winner, has already been eclipsed.

The other promise delivered in 1989 was small – small enough to fit into a standard sized briefcase with room for a printer, portable fax, cellular phone and modem. The first of these lightweight laptops was delivered in Australia mid-year; as subsequent releases shrunk, the market and the excitement grew. These small machines offer a new dimension to computing and will do more to broaden the base of users than any other single class of computer. Their price attracts student, while the size appeals to those on the road and the power to those in the field.

***The Toshiba T1000SE** – excitement at the bottom the range.*

The convenience they offer will appeal to everyone – for the first time, we have real computers, light enough to be used comfortably while sitting up in bed! And, one of the finalists is almost pocket-sized

Our first three hardware contenders this year are so small, that it's tempting to open a new category – halfware. That's not meant to reflect on their power; as we'll see they offer a powerful and useful subset of the features found on their bigger brothers and add to that with a set of features unique to themselves.

Atari Portfolio: Designed in the UK by two ex-Psion (as in Organiser) employees, the Portfolio prototype roused little interest there and it took US-based Atari to realise the potential offered by a Dos-compatible machine with a QWERTY keyboard and weighing only 500g (that includes the power source: three AA batteries). Measuring only about 20 *x* 10 *x* 3cm – that's less than one-twentieth the volume of our 1989 Personal Computer of the Year, Toshiba's T5200 – the Portfolio can *almost* fit into the inside pocket of a suit jacket.

To accomplish that size, the designers reduced the internals to a minimum: a tiny 80C88 microprocessor (which runs at 5Mz), an application-specific integrated circuit (ASIC) to provide PC-compatibility and internal logic, two ROM chips for the BIOS, and four static RAM chips for the operating system. Combined with the thoughtful inclusion of a lip on the case to the left of the keyboard (to allow a firm grip with the left thumb) and a spacious, albeit tiny, keyboard, the Portfolio's design is technically elegant.

Our first impression was that it was a scaled down laptop – and that is exactly what it is, the $600 price included. For those who need portability and convenience, but can't justify the price of a full-featured battery operated laptop, this bit of elegance will be a boon (or is that elegance of bits?)

The Portfolio offers a whole new range of possibilities to 'field' users, while our next two 'halfware' contenders extend the concept of *portable* computing. Dubbed the 'notebooks' (because of their size), machines in this class will very likely represent a seizable proportion of the 60,000+ portables expected to be sold this year in Australia – their size, full-functionality and price mean they will draw some sales from the larger portables, but, more importantly, those same features will create a broader base of computer users.

Toshiba T1000SE: Ordinarily a new entry-level machine for an established range wouldn't cause much excitement. But, when that range is Toshiba's and the machine is the Australian version of the Dynabook, it's time to take notice. The T1000SE has a 9.54MHz 80C86 processor, a 3.5-inch floppy drive and a backlit LCD screen which offers a resolution of

***The Atari Portfolio** – a tiny bit of design elegance.*

640 *x* 400 and a rated 2.5 hours of battery life. With that conventional sounding configuration, Toshiba have included 1Mb of RAM (expandable to 3Mb), a built-in modem slot and MS-Dos 3.3 in ROM for boot-up with out a disk in the drive. Then they encased it in a package 31 *x* 25 *x* 4.5cm – that's about one-quarter the size of the T5200 – weighing 2.8kg and priced it at $2500.

When we earmarked our next contender for inclusion with the Finalists, the reaction was: 'Not another portable!' The general feeling was that in recent years this class of machine has featured heavily in the Awards and it was time for the desktops to take the lead again. After all, less than one in ten PCs sold is a laptop and even the most optimistic forecasts show them with less than 20 per cent of the market three years from now. But – as we noted above: these are the machines that are most expanding the over all *usefulness* of computers.

And Toshiba and the name behind our next contender continue to offer the market truly innovative products, each a logical development from their predecessors, each an excellent example of the features by which other machines should be measured. The 'small' technology of these machines is certain to flow through to the desktop, giving us even less obtrusive footprints.

Compaq LTE: 'Less Than Ever' was our first thought when we read of Compaq's latest – but any reference to 'less' can only be applied to the case. Measuring 22 *x* 28 *x* 5, the LTE and its '286 companion are full-featured PCs – last year we noted that Compaq's SLT was small enough to fit on an airline tray table and now there's room left for an airline lunch, too. The base model has a 9.54MHz 80C86 processor, 640K of RAM (expandable to 2.6Mb), a single 3.5-inch floppy, an electroluminescent, backlit display with a resolution of 640 *x* 200 and a rated battery life of 3.5 hours. At $3300, it's Compaq's entry-level portable. Most remarkably, there is a hard disk option for this tiny package. The LTE/286 with an optional hard disk is going to win the hearts of traveling professional. Compaq's attention to power conservation extends the effectiveness of these notebooks even further.

The Apple camp has been ripening it's small offering for several years now – and in 1989 it dropped. Anyone who fell in love with the original Macintosh and then found themselves lugging it between home and office, will appreciate our next Finalist. Apple's heart was always in the right place – they offered a canvas carry bag for the Mac didn't they? – but it took years of development to bring the screen up to the standard Apple demanded.

***The Compaq LTE** – room for lunch on an airline tray table.*

Macintosh Laptop: The Macintosh line has always been based around the mouse pointer. But, to use the mouse without frustration and with any sort of speed, the cursor must be visible at all times as it's moved across the screen. With LCDs that just isn't possible because of the slow response time of the crystal molecules. Part of the designers' brief for the Laptop was that the battery must have a life long enough for most Mac users to complete the task at hand – ***that*** eliminated a power-hungry gas plasma screen even though the response was there. The Mac's screen is based on an 'active matrix' technology that addresses the cursor problem admirably and offers a high contrast display with a resolution of 640 *x* 200 pixels. Its success will be ensured by the wide viewing angle of the screen: up to 60 degrees.

***The Macintosh Laptop** – twelve hours of battery life.*

The processor is the CMOS (low power consumption) version of Motorola's 68000 and 2Mb of RAM is standard. More interesting is the 6502 (the original Apple II chip) that has been incorporated into the design and is dedicated to power conservation. Combining these features helps gives a rated battery life of 12 hours – however, to accomplish that lead acid batteries had to be included, bringing the system weight up to some 7kg – that's not light, but it's still portable at a price under $10,000. A further indication of the thought that has gone into the design is that the trackball (in lieu of a mouse) can be mounted on either side of the keyboard.

These three laptops and the Portfolio represent the state-of-the-small-art for Australian users. While small may be beautiful to some, others need big – and that's what the next contender offers. It's big on power and that big power brings it head-on with the likes of IBM's AS/400, DEC's VAXs or the HP 9000 minicomputers.

Compaq Deskpro 486/25: In 1987 the Deskpro 386/33 was named our PC of the Year. In summarising, the judges commented that the award was given 'in recognition of [Compaq's] achievement in pushing forward the capabilities of the technology.' The 486/25 has pushed the capability of that technology and of PC

***The Compaq Deskpro 486/25** – pushing PC power to new limits.*

power to new limits. The 25MHz i486 processor is not the only interesting feature – the machine has been designed with two buses for fast transfer of data between the CPU and memory, and up to 1.3 gigabytes of storage can sit behind the front panel. And, the VGA display system has been optimised to give smoother text scrolling and faster graphics.

The border between minicomputers and PCs has been growing less well-defined ever since the first desktop machines were released – and now Compaq have almost completely eliminated it. At the launch, the company noted that the 486/25 was intended for single users needing power for applications such as financial modelling or CAD, while the Systempro was meant to be used for multiprocessing and networking applications. To that end, it features dual processors – users have the choice of two '386s, two i486s, or one of each!

While small is beautiful, big is interesting – next month we'll see which of these innovative contenders is the 1990 Computer of the Year.

Software Product of the Year

THE LARGE NUMBER of PC-based graphics products that were selected as Software Product Finalists last year demonstrated that 'industry standard' machines and their software were reaching par with the graphics ability of the Apples, Amigas and Ataris. The developers for these recognised that graphics was the last frontier – text-based applications had already matured. This year, while deciding which products on the market *now* demonstrated the trends that will affect users for the next several years, we noted several quite different 'pointers'. They all point to the future, but from quite different directions.

Since the first PCs, each new generation of software has incorporated more and more powerful features. Whether these were a result of end-user demand or marketing hooks, the result was the same – users were forced to pay for all those features whether they were needed or not. First they had to pay the spiraling price of the software and its upgrades and then they had to pay the price to upgrade the hardware. Fortunately the in the PC world, the installed base of 640K and 1Mb machines has become so large, that it has the strength to resist that trend.

It's become apparent that the 90/10 principle is in effect: 90 per cent of users are paying for features they use 10 per cent of the time and only 10 per cent need 90 per cent of the features offered. The corollary to that hypothesis is that 0 per cent want 100 percent. That's not as facetious as it might sound – increasingly, users are seeking a modular approach to software.

Why pay a $1000 for bells, whistles, interfaces, drivers and size – or whatever the latest 'enhancements' offer – when you only need a bell and an interface? Or, the application might work most effectively with two bells and an interface – traditionally that's meant spending $2000 on two packages. With a modular approach the package is broken into its components and sets of these are then offered for different applications – in our hypothetical example, the user would then pay $200 each for the modules he wanted.

This concept has always been used by accounting software which has a modularity inherent in the various ledgers. And, we've seen it in other products: WordStar 3 and 2000 were an early example and the two versions of WordPerfect are a recent

PCs of Yesteryear

THIS IS THE eighth year that *Your Computer* has presented an Award for the Personal Computer of the Year. The history of the awards is quite an interesting summary of the past eight years of personal computing, showing both successes and failures. The winners were invariably innovative in one way or another, and show what was considered to be state-of-the-art at the time.

The first awards, announced in the May 1983 issue, had six hardware finalists – three eight-bit machines, and the rest with 16-bit processors. One of these was the original IBM-PC, and there was the Columbia MPC, one of the first PC clones. The award was given to the NEC Advanced Personal Computer, an 8086-based machine with an impressive (for the time) graphics resolution of 640 by 475. That's only five lines less in the vertical direction than the current VGA! The dominant operating system at the time was CP/M, either 2.2 for the 8-bit machines, or CP/M-86 for the 8088 and 8086 processors.

In 1984 we introduced a new category: Software Product of the Year, which was snapped up by Lotus 1-2-3 – one of the most successful programs ever written. On the other hand, the winner of the hardware award was the ill-fated Apple Lisa, which was so far ahead of all the other finalists in terms of features and performance (it had a 68000 32/16-bit processor, and a whole megabyte of RAM), that the judges found it hard to go past. Unfortunately, its success was short-lived, and the machine died soon after.

The first laptop to win the PCOTY Award was Hewlett-Packard's HP 110, the winner in 1985. It sported a 5.33MHz 80C86, 272K of CMOS RAM, a 16-line display, and a single disk drive. That year, Microsoft's Flight Simulator stole the software award from the likes of SideKick, Open Access, Symphony and Concurrent CP/M 3.11 (for the IBM-PC, believe it or not).

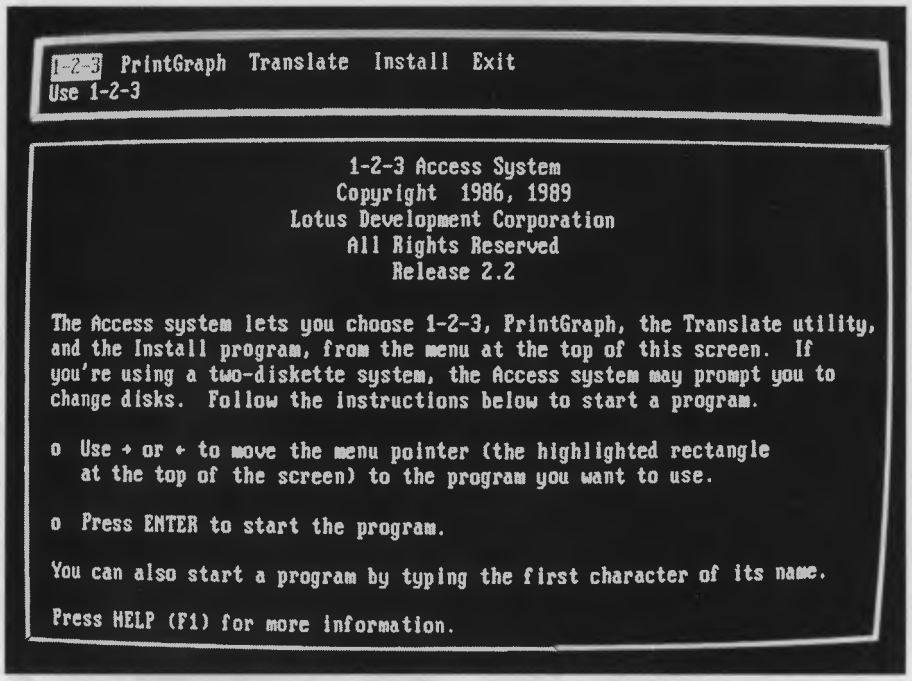
Big Blue took out the 1986 PC Award, with the PC/AT. Although the machine had already spawned the first of a never-ending rush of clones, IBM was awarded the prize for setting the pace. The software award went to Symantec's Q&A, the integrated database manager and word processor.

In 1987, the finalists included the Commodore Amiga, Apple IIGS, and the Toshiba T3100 laptop, but the final winner was Compaq's Deskpro 386, one of the first 386-based PC clones to appear on the market. Aldus took out the Software Award that year for PageMaker, which ran under both the Mac and DOS environments (the latter with Windows).

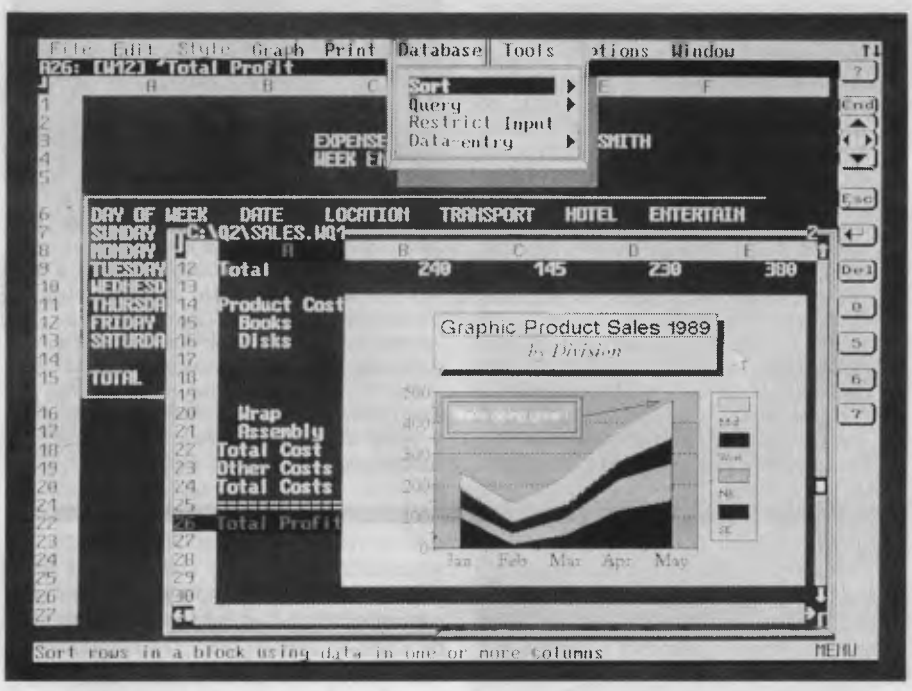
1988 saw a close battle between the Compaq Portable 386, Toshiba's '386-powered T5100, and the eventual winner, the Macintosh II. The Mac II finally delivered the sort of power machine which Apple promised with 1984's hapless winner, the Lisa. The software award again went to a desktop publishing package – this time it was Xerox's Ventura Publisher.

Toshiba managed to make the PCOTY finals every second year since their inception, in 1984 (with the T100 desktop), 1986 (for the T1100 portable), and 1988 (the T5100), so it was not surprising that it finally came up with a winner last year, with its portable powerhouse, the T5200. The Mac spreadsheet Wingz took out last year's Software Award – the second spreadsheet to win the award, and worlds apart from Lotus 1-2-3, the first winner.

What about 1990? Well we're going to have to wait for next month's ...



Lotus 1-2-3- release 2.2 – a promising reaction to user needs.



***Borland Quattro Pro** – the standard publishing and on-screen graphics capabilities have to be seen to be believed.*

one, but these are overlapping versions with and without certain features, not modules; Peter Norton's self-named Utilities and Commander is probably the best example of modularity, albeit a simple one. We have yet to see a fully developed implementation of the idea.

A second trend that became apparent was that the categories of software are starting to blur. This has become apparent, for example, with word processing packages: the features war quickly pushed them into the realm of desktop publishing. Regardless of the primary application for which a package has been developed – database, word processor or spreadsheet are the most common – it will very likely incorporate some form of the other two.

What we see here is a move away from application specific software and the emergence of products that do more than manipulate data, words and numbers – they handle 'information' Two of our Finalists are at the leading edge of this trend towards 'information technology', although they are coming from different directions.

Lotus 1-2-3 release 2.2: In 1984 we introduced the Software Product category and the depth of features combined with a shallow learning curve of 1-2-3 release 1A saw it win the Award. Since then, it has gone on to be the world's most successful software product. Then came release 3 – two years after its announcement – with linked spreadsheets, alternative views, external database access and a host of other features users had been waiting for. But the price was there too – users needed at least 1Mb of RAM and an AT to use it effectively. That left a very large part of the installed base and potential converts in the cold.

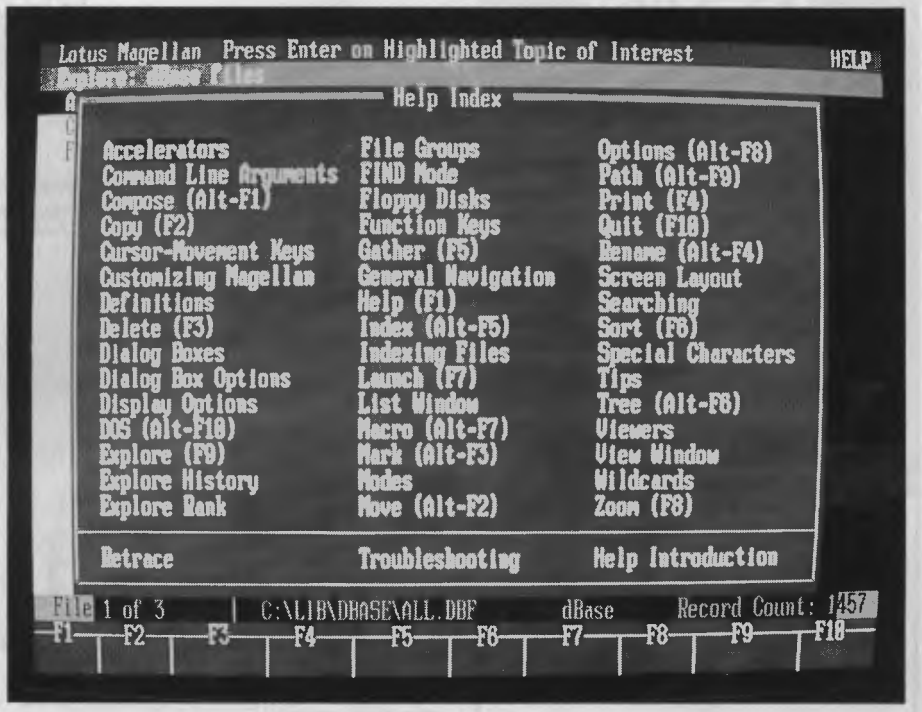
Lotus warmed them up with release 2.2 which only needs 640K of RAM and an 8086. We don't claim the company's motives were purely altruistic, but the reaction to user needs is promising. It offers some enhancements when compared to 2.01, but nothing like the quantum leap 3 made. We include it in our selections because one of the world's most established purveyors of software has recognised that not every users has, wants or should need unlimited RAM and processing power – and the company reacted.

Next, we have (for quite different reasons) another spreadsheet. It meets both versions of Lotus head-on and appears to be the first real threat that product has seen in the spreadsheet arena.

Quattro Pro: Borland is noted for taking its own approach to software development and this product epitomises that. Although it needs around 4Mb of disk space when installed, it will happily run on a 512K 8086 with no expanded memory – a Virtual Real-Time Object Oriented

Memory Manager is the secret, we're told. In essence, that means the software swaps numerous 2 to 4K sections of code between the hard disk and RAM while running. The standard publishing and on-screen graphics capabilities have to be seen to be believed – add that to the linking and consolidation features, which match those of 1-2-3 release 3, plus the memory manager, and this is one of the most innovative products of the year.

When we saw the ability to view dBase and 1-2-3 files in the second release of the Norton Commander, our first thought was 'why hadn't it been done before in a file manager' (it had been, but none of us had seen it then). This seemingly simple facility has since literally saved us hours: it's no longer necessary to wait for the application to fire up and then, if it's necessary to view a second file, there's no bothersome quitting and loading a new file. The second offering from Lotus in our Finalists list has taken that and the concept of 'file management' almost to its practical limits.



***Lotus Magellan** – bringing a glimpse of true information management.*

Lotus Magellan: When we only had floppy drives, file management was quite straightforward. And, even the files that could fit on a 10Mb hard disk weren't much of a problem. But now, 20, 40 and even 100Mb of application files on a single disk are common. Managing and making efficient use of them without sophisticated help can be a time consuming problem. Magellan offers that help and is described by Lotus as a 'DOS shell, file management utility and text retrieval software.'

The two most notable features it has are the ability to view files in a range of formats, including dBase, MS Word, ASCII, WordStar, WordPerfect and Multimate (a development kit for viewers to other formats has recently been released); and the facility to launch almost any application from within Magellan, at which point the program retires to the background taking only 4K of RAM with it. Text searches are possible through a maximum of 32,000 files and across networks and CD-ROM drives – literally any drive the PC can access. Magellan has brought a welcome sophistication to 'file management' and gives us a glimpse of the possibilities of true information management on a PC and it's here today.

That concept is taken even further by our next Finalist. It was developed by one of the biggest names in the computer industry although it's not usually associated with software. Still, they have shown us the possibilities of the much-touted graphical user interface (GUI) on the PC and the program's influence will be seen in software releases for some time to come.

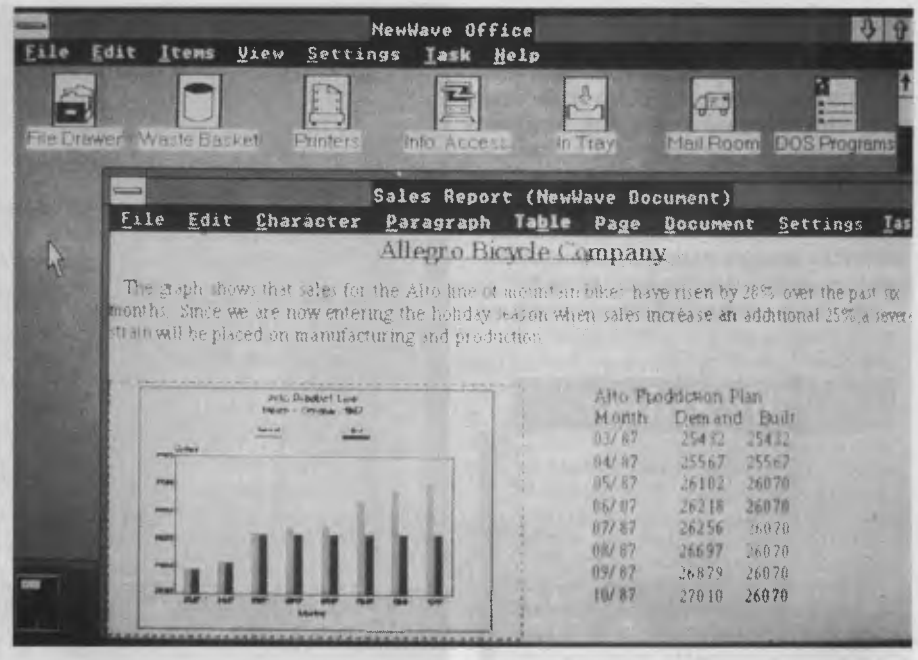
Hewlett-Packard NewWave: To appreciate the power of a product like this, it's necessary to re-think the way we use documents and applications in our work. NewWave runs under MS Windows/286 and adds an object orientation to any file in the system. By defining files as objects,

The rules

EACH YEAR when it comes time to judge the Awards, we find ourselves in a dilemma: how can the megapower of machines designed as engineering tools and the emotional impact of fun machines with lots of graphics and sound be asked to complete with one another? And, each year as the power versus fun arguments arise, we find ourselves returning to basics and stringently applying the criteria (all roughly equal in importance) we have used throughout the Personal Computer of the Year's history –

- Technical Excellence in design and engineering, including quality, reliability, 'feel' and features.
- Innovation – is the product truly new and conceptually different? Does it offer types of features never-before available?
- Ergonomics in terms of both hardware and software design – is it easy and comfortable to use; is the design logical and intuitive?
- Value – are the features and functions worth the asking price?
- Presentation: How does the product look? What are the documents and packaging like?
- Market acceptance and placement – what do users think about the product? How well has it been accepted? Does it address a broad range of user needs effectively? Has it created a new niche of its own? How does it compare in the market with products aimed at a similar market?

Note that we do not feel constrained to consider only those criteria. With the current geometric rate of development in the computer industry, a product that breaks all the rules could be released at any time and be precluded by these criteria – even though it might be totally revolutionary to personal computing.



***Hewlett-Packard NewWave** – offering a flexible and powerful graphics oriented operating system.*

links can be created between them to give a dynamic working environment. For example, you may be writing a report in Samna's Ami Professional and need to include part of a Microsoft Exel spreadsheet. You open a window for Exel, copy the data you want to the clipboard and paste it into your document.

That's a straightforward Windows application – until you notice that one of the cells from the spreadsheet needs updating. Selecting the spreadsheet (in Ami, remember) causes Exel to fire up; you then make your corrections *without* exiting the word processor and carry on. Further down, you want to include a graph from Micrografx Graph Plus – that's just as easy and when you decide a line graph presents your idea better than the original bar, select it and change it: both the original and your document will hold the changes. (Those three products were particularly chosen because they are likely to be the first NewWave applications we'll see.)

The ease and the power of those links between documents makes us realise how disjointed and un-natural our previous manner of working with multiple documents has been. More significantly, NewWave extends the Dynamic Data Exchange possible with Windows and makes it part of a flexible and powerful graphic oriented operating system for the PC.

At the post

OUR HARDWARE and software contenders are now lined up at the post, ready for the run to claim the Awards – a hand-held, three laptops and a PC that is more mini- than personal, in the hardware stakes, and two spreadsheets, a file manager and an operating system in the software.

Because we have changed the time frame for the Awards, we have fewer Finalists this year. Previously, products needed to be released between July and June of the following year, but to eliminate the confusion that caused everyone, products must be released – and delivered! – during the calendar year. Several products we thought we worthy of inclusion had to be eliminated from the Awards because the distributor was unable to actually show us a product ready for sale – in one instance the product had been 'released' three months(!) before amidst great fanfare. It appears that marketing is more important to many in the computer industry, than the product itself.

The Australian Commendations haven't been forgotten – next month we'll tell of the best coming up from Down Under. □

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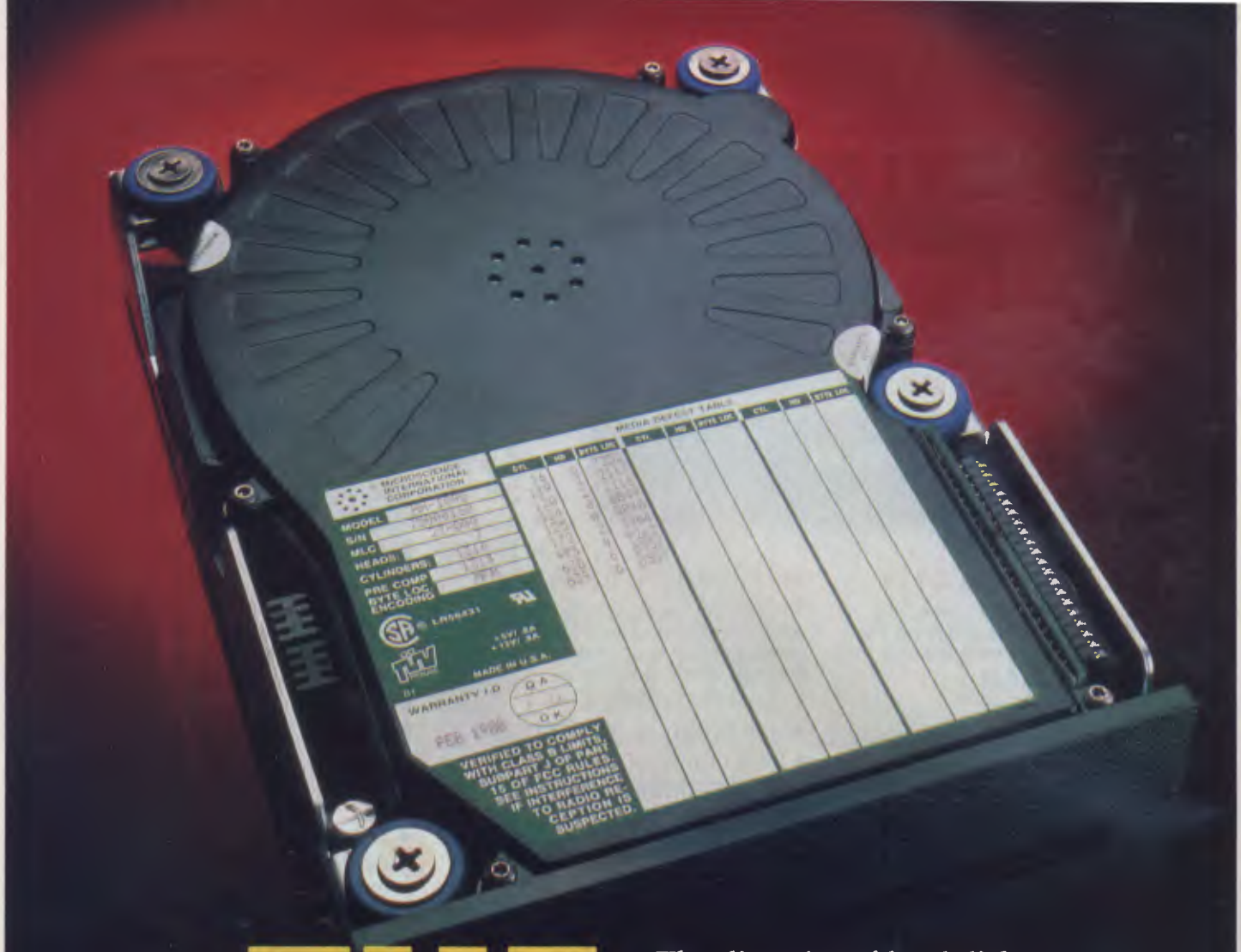


THE HARD FACTS

The diversity of hard disk drives and controllers available doesn't make a choice easy, Mark Cheeseman sorts it out.

UNLIKE FLOPPY disks, which can be easily transferred between systems at will, a hard disk is an integral part of the computer in which it is installed. The convenience of having all your executable and data files accessible almost instantaneously has resulted in a hard disk being standard equipment in most computers today, and this has in turn resulted in software writers relying on this capacity to allow the storage of large databases for uses such as spelling checkers, pop-up postcode listings, and so on.

With this ever-increasing amount of data vying for storage space on a user's hard disk, we can expect them to continue getting bigger in size for quite some time yet. With the 32 megabyte partition limit finally broken with Dos 4.0, it is now possible to have a large hard disk, without hav-

ing to chop your data up into small pieces to fit it on the disk.

Mechanically, a hard disk is quite a simple device, regardless of the interface used – ST412/506, ESDI or SCSI (more on these later). Inside the sealed enclosure is a number of aluminium disks, or platters, spinning at 3600 revolutions per minute – more than ten times as fast as a floppy drive. Unlike a floppy disk, hard disks spin all the time, so that time is not wasted while the disk comes up to speed each time it is accessed.

Each platter is coated on both sides with a special magnetic coating, similar to that used on recording tapes and floppy disks. The particles contained in this coating can be re-orientated by the application of a magnetic field (generated by heads similar to those used in tape recorders), and these particles in turn generate their own field, which can be detected by the same heads which aligned them in the first place.

The heads on each side of each platter 'float' a small distance from the surface of the disk, and are kept there by the movement of air created by the spinning disk. When the disk stops spinning, the heads actually 'land' on the surface of the disk. This is wearing on both the disk surface and the heads. For this reason, it is usual to *park* the heads in a dedicated landing zone, to prevent damage to areas of the disk carrying data.

Each of the two heads serving each platter in the drive is attached to an actuator arm, which moves the head in and out in a radial direction under the control of another motor. All the heads in the drive move in unison – the more heads in a hard drive, the more data is accessible without moving the heads.

There are two types of head actuator – the stepper motor, and the voice coil motor. Stepper motors are a special type of electric motor, which rotate through an exact amount each time an electrical pulse is applied to the motor. This rotation is then converted to a linear motion by a flexible metal band wrapped around a drum attached to the shaft of the motor. To move the heads a given number of tracks, that number of pulses is sent to the motor. All of this mass in moving parts translates to a high inertia, restricting the speed at which the heads can accelerate, thus limiting access times of the drive.

A far simpler approach, mechanically at least, is the voice coil actuator – so designated because it resembles the voice coil

Spinrite – re-format on the go

ALTHOUGH THE interleave of a hard disc is set during the low-level formatting process, it is not impossible to change it later on, without losing your data. One utility which allows you to non-destructively re-format a hard disc is Spinrite. Now in version 2, it can handle a wide range of partitioning options, including those created by OnTrack's Disk Manager, Speedstor from Storage Dimensions, Everex's Everdisk, and even Dos 4.0x partitions larger than 32Mb.

Spinrite can be used with RLL controllers (provided that controller does not use sector translation, where the extra capacity of the drive appears as additional cylinders, rather than more sectors), and even the Perstor Systems Advanced controller (see separate box item). There are some unusual hard disks which cannot be optimised by Spinrite, but these are clearly described in the manual and the on-disk 'readme' file.

Spinrite automatically checks for disk caching programs, which as you can imagine, will play havoc with the program's ability to evaluate drive performance and to improve it. It also checks the integrity of the controller, and both system and controller RAM, to ensure that it doesn't destroy your data in the process.

A 'quick surface scan' function checks each sector on the disk for reliability, and corrects any problems. This option works both ways – it will mark sectors which are currently in use, but potentially unreliable, as bad, and will also release good sectors which have been erroneously marked as bad. This takes only a few minutes to perform, and it is a good idea to run it every now and again, to check for new errors.

The main part of Spinrite is of course the low-level re-formatter, which allows the interleave to be adjusted to suit the particular system. First of all, it perform a series of tests on the drive, to help it determine the optimum interleave for the drive. The user is then presented with a range of possible interleave factors, showing both the current setting and the calculated optimum value.

Once the new interleave has been selected, Spinrite then sets about the task of re-formatting the hard disk, without losing any of your data in the process. This takes quite a while, although it can be safely interrupted and resumed at some later time if needs be.

The version of Spinrite which we examined was version 1.2. Version 2.0 arrived in Australia just as we went to press – too late, unfortunately, for us to get hold of a copy for a test run. Spinrite is distributed by Lysbeth Computers, 114 Albert Rd, South Melbourne 3205 Vic., (03) 693 6430, and is priced at $230.

which moves the cone in loudspeakers. A voice coil is a linear motor, so that its motion can be used to move the heads directly, without any superfluous moving parts to slow down head motion. For this reason, voice coil drives have much lower access times than the stepper motor variety, although the head positioning circuitry is more complicated.

The reason for this is that the only way to know exactly which track of the disk the heads are above is to have a form of feedback from the actuator. This is compared to where the heads should be, and the current through the voice coil is adjusted so that the two match.

Like floppy disks, the surface of each platter in a hard disk is divided up into tracks. The correspondingly numbered tracks on each of the surfaces in a drive are collectively called a cylinder, since they form the shape of the outside of a cylinder.

Each track is further sub-divided into sectors, each of which stores 512 bytes of data. Ordinary hard disks typically have 17 sectors per track, while RLL drives (we'll get to RLL a little later) have 26 sectors, and ESDI drives have 34.

These two SCSI drives from Quantum store 42Mb (right) and 84Mb (left). The positioning of the heads in the operating and retracted positions are clearly visible. Quantum is also distributed in Australia by Allaw Technologies.

Keeping it under control

HARD DISKS are interfaced to the rest of the computer through a controller, which is charged with the task of looking after the positioning of the heads, selecting the correct head for reading and writing, and locating the desired sector to be read or written. The most common hard disk controller standard is the ST506, in which the controller is connected to one or more hard disks through a daisy-chain control cable, with an additional data cable for each drive.

The reason for the separate data and control cables will become more apparent a bit later on. The control cable, as its title tends to imply, carries signals from the controller to one or more drives, to instruct the drive where to position the heads, and which of the many heads to select for the next read or write operation. Another line lets the controller know when the seek is complete – it tells the controller when the heads have settled and where the controller sent them, so that reading or writing can begin. Since more than one drive can be connected to the one control-

ler (usually two or four), this cable also carries lines to select which of the connected drives is being used at the time.

The data cable carries the actual signals to and from the drive. Because the signals from the heads are rather weak, any noise picked up by this cable, or any unwanted reflections in the cable, will cause the data to be corrupted at the controller end. For this reason, each drive has its own data cable to connect it to the controller, so that the electrical conditions appearing on the line are known, and do not depend on how many drives are connected to the controller.

Each drive has a *drive-select* jumper, which determines which drive signals from the controller that it will respond to. This jumper occupies one of four positions, implying that up to four drives can be connected to a single controller. However, the controllers in virtually all XT and AT class machines are capable of controlling only two drives (they only have two data cable connectors). This is still twice as many drives as most people have in their machines.

In IBM PCs and compatibles, however, the drive select jumpers are not used to allocate drive numbers to the drives – both drives (if there are two) are selected as the second drive in the system. The actual position of each drive on the control cable determines which drive is the first (drive 0), and which is the second (drive 1) in the system. This simplifies installation of a new drive, assuming that the drive was shipped with the jumper in the correct position originally.

After the data is read from the surface of the disk, it passes along this cable to a part of the controller called the data separator. This converts the electrical signals from the selected head back into the data which generated them in the first place. The data is encoded using a technique called MFM, or modified frequency modulation (the same technique is used in floppy drives). This data encoding scheme can be likened to a high-speed modem, allowing binary values to be stored on a medium which is analog in nature, just as a modem is needed for computers to communicate over an analog phone line.

This data is then stored in a sector buffer – so called because a whole sector is read into it at a time. When the sector buffer is filled, the system can then read it out of the buffer and place it in main memory. To speed up this operation, the movement of the data is performed by the DMA controller in the computer, which performs this sort of I/O operation faster than the main processor is capable of.

One parameter which has a dramatic effect on actual transfer rates is the interleave of the disk. The interleave is determined during low-level formatting, although utilities do exist which allow non-destructive interleave adjustment (see side-bar). A disk with a 1:1 interleave has all the sectors on each track in numerical order. However, if the CPU cannot read a sector out of the sector buffer in the time before the next one comes around, it has to wait for an entire disk revolution before it can read the next sector – wasting time, and degrading performance significantly.

When reading a disk with a 2:1 interleave, the controller reads one sector, skips the next one, and then reads the one following. This gives the CPU more time to read the sector buffer, without having to wait an entire disk revolution. The skipped sectors are not wasted space, of course – they are just the higher numbered sectors of that track. A 3:1 interleave (probably the most common setting) skips two sectors for each one read, giving the CPU more time still to read the data out of the sector buffer.

A slight improvement in both storage capacity and data transfer rate can be achieved by using a run-length limited (RLL) controller.

The aforementioned ST506 type of controller/drive interface was developed when processor speeds were much lower than they are today. The drive could supply data as fast as the processor could accept it. However, as processing speed increased, and the amount of data which could be stored on a track of a disk increased with it, the bottleneck between the drive and the controller became the limiting factor.

ST506 drives are capable of peak transfer rates of 5 megabits per second, which equates to about 640K per second. However, this is a maximum rate only – the rate at which data flows from a single track on the disk. This is a physical constant, set by the amount of data on a single track (17 sectors of 512 bytes each), and the speed of rotation of the disk (3600 rpm). If data has to be read from more than one track (as in most real-world situations), then this speed will drop markedly, while the heads re-position themselves over the next track.

A slight improvement in both storage capacity and data transfer rate can be achieved by using a run-length limited (RLL) controller. Although an RLL controller can theoretically make use of any ST506 drive, the increased data storage capacity means that the physical parameters of the drive, such as the speed of rotation, is more critical. For this reason it is considered unwise to use a standard drive with an RLL controller, as small defects which would not be noticed by an MFM controller might upset an RLL device. An RLL drive stores 50 per cent more data than MFM does on the same drive, and the maximum data transfer rate also increases by 50 per cent, to 7.5 megabits per second.

ESDI and SCSI

TO FURTHER IMPROVE data transfer rates, an enhanced ST506 interface was designed, dubbed the *enhanced small device interface*, or ESDI. In operation, ESDI is similar to ST506, with one important difference – the data separator is built into the drive itself, rather than being part of the controller. Because the signals from the heads do not have to travel down a long cable to the data separator, the actual transfer rate can be made higher than in the ST506 interface, without risking data corruption.

In fact, ESDI is rated for speeds of up to 15 megabits per second, three times that of an ST506 drive using MFM, and double that of one using RLL. ESDI is commonly used on drives ranging from about 80Mb to 760Mb in size.

Even faster than ESDI is SCSI, which is rapidly emerging as the device interface of choice for many demanding applications. For one, SCSI acts at more of a logical level than either ST506 or ESDI (which are device-level disk interfaces, and nothing more), and can control not only disk drives, but also devices such as tape drives, printers and scanners. Up to seven devices can be daisy-chained together on a single SCSI bus, as opposed to the two which can be handled by most contempo-

Interleave's Keith Hardwick believes that 'Australian equipment buyers can expect to see 40 megabyte 5.25 inch hard drives become the standard entry-level storage system within a year, with 80 megabyte models becoming standard.'

rary implementations of ST506 and ESDI. SCSI isolates the physical parameters of the device from the system, making interfacing a relatively simple process.

This flexibility is especially valuable in older Macs, where the SCSI bus was the only way to add extra devices on to the computer. Even the SE and SE/30 only have a single expansion slot, so the daisy-chaining ability of the SCSI port is still extremely useful. SCSI operates at speeds of up to 5 megabytes per second

And, as if SCSI is not fast enough already, a new version of SCSI has already been defined – SCSI-2. Using 16- or 32-bit data paths, offers data transfer rates of up to 40 megabytes per second – eight times the 'old' SCSI rate. Suffice to say, there aren't many drives around that can retrieve data at this rate.

One way to make use of these extremely high data transfer rates is to use a drive array, where several drives are synchronised together, and the data is split between the number of drives in the array – effectively multiplying the data transfer rate of each drive by the number of drives in the array. Of course, the capacity of a drive array is also equal to the total capacity of all the drives put together, although the access time is the same as that for a single drive. Drive arrays are becoming popular for multi-user and file server applications which require the movement of large amounts of data as quickly as possible.

In addition to the data transfer rate, there is another drive parameter which determines how fast a drive accesses the data on it (known as access time). A drive typically has two access time specifications, track-to-track access time, and average access time. The first of these is really only relevant to the retrieval of large amounts of data from sequential tracks, and is the amount of time lost while the heads step between tracks.

The average access time is a more use-

ful measure, being the time it takes to move from a random track on the disk to another random track. To test average access time, a number of such seeks are measured, including both small and large jumps between tracks, and the result is averaged out. This test is more typical of real-life disk use than is the track-to-track time.

Some advanced disk controllers improve access time by utilising a track buffer rather than a sector buffer. As you might have guessed, when a sector is called for from the disk's surface, the entire track is read into the buffer, although only the requested sector is passed to the operating system. If another sector from the same track is called for, the controller knows that it is already in the buffer, and it sends it directly to the system without having to read it from the disk first.

Toshiba's disk drive plant at Ome, near Tokyo. Here, assembled drives are being tested in one of the Plant's Clean Rooms.

Disks, Dos and BIOS

THE DISK OPERATING system, or Dos, is basically there to isolate applications from the physical tasks of writing data to (and reading it back from) the disk drives. MS-Dos and PC-Dos group sectors of floppy and hard disks into logical entities known as clusters. A cluster is the smallest unit of disk space that Dos can allocate to a file. Even if a file is only one byte long, a complete cluster needs to be allocated to store this file.

On floppy disks, each cluster consists of two sectors, making it 1K in size. Most hard disks have a cluster size of 2K, made up of four physical sectors on the disk. The first few sectors of the drive are not allocated at the Dos level as clusters, but are used to store special information that is used to load Dos when the machine is first booted up.

Hard disk recovery tools

PROBABLY THE BEST known disk utility on the market, is the Norton Utility, currently in version being 4.5. This version fixes some problems with version 4.0, notably the inability to work with Dos 4.0x. The latest version also includes a few new utilities, such as the Norton Disk Doctor (NDD) and Norton Control Centre (NCC).

NDD performs a general test on the drive, which includes searching for lost chains (as Dos *chkdsk* does) and, optionally, physically checking all the sectors on the drive for integrity. It can also make a non-system disk bootable, like the Dos *sys* command, but goes one better than Dos by moving any existing files out of the system area instead of simply reporting 'No room for system'.

NDD can also recover the data from a defunct floppy disk, and recover from the Dos 'recover' command, recovering directories as well as files.

NCC, while not strictly a disk utility, is useful for setting parameters such as cursor size, screen colors, serial port parameters and so on. All the old favorites are there, like quick unerase, format recover and the main Norton Utility program – NU.

Speed disk had been greatly enhanced, with a series of optional menus to allow the user to determine to a certain extent how the disk is to be re-organised. This includes a list of file types to put first, the sort order for directories, and a selection of different types of sort. These range from just sorting directories, through 'quick compress' and 'file unfragment' options, to a full sort.

The format recover utility works best if it is placed in the system's autoexec.bat file, so that it is executed frequently. When run with the save option, it records an image of the arrangement of files and directories on the hard disk. If the hard disk is accidentally formatted (or its FAT gets trashed, for some reason), format recover can identify its saved information from the jumble of bits that used to be your files, and re-create the entire directory tree from scratch.

The Norton Utilities are distributed by PC Extras, on (02) 319 2155, and are priced at $135, and $195 for the Advanced Edition.

The very first sector of the disk is known as the ***boot sector*** or ***boot record***. This holds a small machine-language program which loads Dos properly from the disk into memory. The next sector contains the partition table, which stores the starting and ending locations of up to four partitions – or logical drives – which occupy the one physical drive. They may all be Dos partitions, or one or more partitions may be used by other operating systems, such as Xenix.

After the partition table come two file allocation tables. During normal use, the two tables are identical to one another, but if one becomes corrupted, some utility software can fix up the first FAT using the information contained in the second. Dos only reads information from the first FAT, so if it becomes corrupted, Dos is not capable of fixing the problem itself.

Following the partition table, comes the root directory, which contains the names, file attributes, and starting cluster of the files and directories on the disk. The location and size of the root directory is fixed when the partition is formatted (using Dos *format*), so that there is a limit on the number of files which can be stored in the root directory – usually 512.

To locate the clusters in a file after the first, Dos looks at the file allocation table. If, for example, the file starts at cluster 100, then Dos looks at the 100th entry in the FAT, and that location contains the number of the next cluster in the file. If a particular cluster is the last in the file, then the value FFFF (hex) indicates the end of the file. The actual byte which is the last byte of the file is determined by the file-size entry in the directory.

A value of zero in a location indicates that the particular is unallocated, and is free for use. When Dos needs to store a new file on the disk, it searches the FAT for the first zero entry, and allocates that cluster to the file. The process is repeated for subsequent clusters in the file, until the entire file has been stored to disk. Bad sectors are also marked with a special entry in the FAT, so that files are not stored in unreliable locations on the disk.

Dos versions before 4.00 could only handle disk partitions of up to 32Mb, due to the size of the FAT. While each entry in the FAT is a 16-bit number, corresponding to 64K possible clusters, or 128Mb, with a 2K cluster size, the maximum size of a FAT in Dos 3.3 and lower was restricted to 32K of disk space, corresponding to a maximum of 16K clusters, or 32Mb of storage space.

The standard way to use a larger drive than 32Mb was to partition the drive into two or more partitions of 32Mb or less, and treat each partition as a separate drive, with its own FAT and root directory. Some OEMs avoided chopping their nice big drives into little pieces by packaging special versions of Dos with the machine, which pack more sectors into each cluster, or increased the size of the sectors themselves, and thus increased the disk capacity while maintaining the 16K cluster limit. The down-side of this approach is that the wasted space for small files also increased, although it was hardly noticed in a drive of that size.

Dos 4.00 solved the problem of the 32 megabyte limit, by increasing the limit on the size of the fat to 64K, corresponding to the maximum number of clusters which can be uniquely addressed with the 16-bit entries in the FAT and directories. The maximum partition size supported by Dos 4.0x is 2 gigabytes, which should be enough for just about anybody (of course, that's what they said about the 32 megabyte limit of earlier versions).

Dos also incorporates a feature which improves the speed of disk access – buffers. Buffers are optionally installed through the config.sys file, and Dos uses these to store the most recently-accessed sectors of the disk drive. If Dos receives a command to read a disk sector, it first checks to see whether the sector is already held in a buffer in memory. If it is, then

Dos sends the program which called Dos, the contents of the buffer, which can be accessed much quicker than the disk itself.

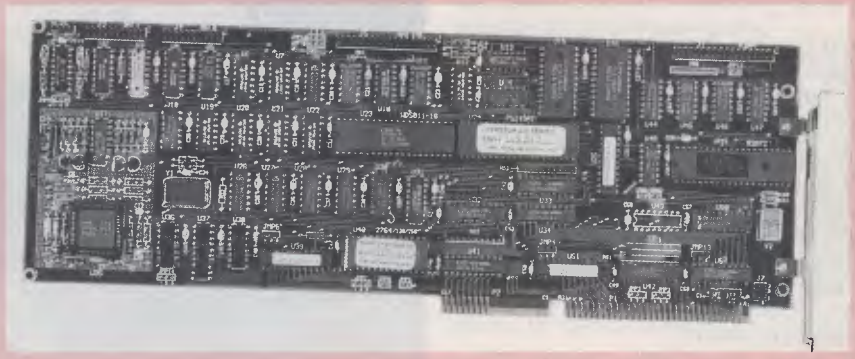
You can see the action of the buffers yourself by watching the the hard disk access light while reading a directory which hasn't been accessed for some time. When you type in the command, the disk light will flash while the directory is read from the disk. If you now type in the command again, and you have defined enough buffers in config.sys, then the directory will appear without any visible disk access – the information was already in one of the memory buffers.

Dos 4.00 improved the buffer command in two ways. First of all, it optionally allows the buffers to be placed in expanded (EMS) memory, if it exists; this avoids losing precious main memory to disk buffers. The other enhancement is the addition of look-ahead buffers. When Dos is instructed to read a disk sector, it also reads ahead by the number of sectors specified in the buffers statement. This speeds up accesses which read several sectors at once, provided the files aren't too fragmented.

Priam manufactures a wide range of hard disks, ranging all the way up to the 760 megabyte SCSI and ESDI units shown here. Priam is distributed in Australia by Allaw Technologies, (02) 406 9111.

Dos accesses most system resources, including hard disks, through the BIOS (Basic Input/Output System) built into the computer. When power is applied to the system, the BIOS needs to know a few details about the hard disk(s) in the system,

Cramming it in



PERSTOR SYSTEMS have thrown existing standards out the window, and come up with a revolutionary way in which to encode about 90 per cent more data on an existing hard disk. Well, they haven't entirely abandoned all existing standards – the controller controls virtually any standard ST506 drive, whether it is currently using MFM or RLL. The increase of 90 per cent in capacity is a comparison of the ADRT encoding method used by Perstor with the standard MFM system.

The Perstor controller uses a proprietary encoding scheme called ADRT (Advanced Data Recording Technology), for which patents are currently pending. The technique is the culmination of two years of design work and testing, and the first ADRT controller was released late in 1986. Since then, Perstor has released models for the AT, with a 16-bit bus, and special models for use in Xenix systems and Novell servers.

The ADRT system uses 31 sectors per track, compared with 17 for MFM and 26 for RLL. However, the maximum rate of flux change on the surface of the disk is lower than that used by RLL, and only about 15 per cent higher than MFM, so that ordinary MFM drives can be used without any problems. This is achieved through a special encoding scheme, which is no doubt the subject of the aforementioned patent. The Perstor controller also makes use of improvements in areas such as write precompensation and read post-compensation, noise reduction and other areas which enhance the recovery of data from the disk exactly as recorded.

The error correction code used in the ADRT controller is also a 56-bit word, rather than the more usual 32-bit code, the probability of mis-corrected data is actually lower than an MFM encoding scheme, in spite of the slight increase in magnetic density on the surface of the disk.

The Perstor controller has another advantage for those systems with BIOS drive tables without many entries. Since the controller has its own table and dedicated setup program, the system is not restricted to the range of drive options allowed for by the internal BIOS.

When the new controller is installed, the computer's normal setup program is run, and told that there are no hard disks installed. Then the controller's supplied setup utility is run, so that the controller knows what type of drive is there. When the system is booted up, the controller's on-board BIOS takes over the task of interacting with the disk drive.

The controller also has a dual floppy controller on board, so that it is a simple drop-in replacement for the existing AT hard/floppy controller. The controller board also comes with its own low-level formatting program, but after running that, the normal Dos Fdisk and Format commands can be used. And yes, it works with Dos 4.0x large partitions, and disk partitioning software such as Ontrack's Disk Manager. The low-level formatting routine also determines the optimum interleave for the drive, and locates and marks out any bad sectors.

The only problem I had with the Perstor controller was a BIOS incompatibility – my old AMI BIOS kept getting upset when it could tell that there was a hard disk there, but couldn't find it in the CMOS setup. An updated BIOS soon fixed this, so provided your BIOS is not years old like mine, you shouldn't encounter this problem.

Perstor ADRT controllers are distributed in Australia by Bitwise Systems, 1/28-30 Lilian Fowler Pl, Marrickville 2204 NSW, (02) 516 5244, and the PS180-16FN (AT model, as tested) is priced at $475, including sales tax.

so that they can be accessed properly. In AT machines, this information is stored in a special table in the BIOS ROM chips, which contains the parameters for a selection of different drives. The table stores the number of heads in the drive, the total number of cylinders, the cylinder at which write-precompensation starts (the point at which the current through the read/write heads is increased to compensate for closer packing of the data at the centre of the disk), and the landing zone (where the heads are parked before turning the power off). An entry in the setup RAM points to the correct entry for up to two hard disks.

The problem with drive tables is that they are not big enough to hold the parameters for every drive ever produced, to say nothing of the new models which appear from time to time! Fortunately, there is a way around this problem, thanks to third-party utility software. The hard disk is installed using the entry in the BIOS table which most closely matches the drive's parameters, without exceeding them, and a special device driver is loaded from config.sys to make the rest of the disk accessible.

The original IBM PC did not have a hard disk (they were the exclusive domain of the power user in those days), nor did it have room for one, unless one of the floppy drives was removed. This paved the way for a novel approach to hard disk design – the hard card. A hard card consists of a 3.5-inch hard disk and the associated controller mounted on the same card.

The drives in earliest hard cards were rather large, so that the card hung over into the adjacent slot, restricting that slot to holding a short card at best, or nothing

at all. Some early hard cards also earned a reputation for unreliability, as 3.5-inch hard disk technology was rather new, and the off-centre weight of the card sometimes strained the card and edge-connector. Fortunately, the drives in hard cards have improved in both size and reliability, the actual drives having similar size and weight specifications to those used in laptops.

Drives for hard cards and laptops have another requirement in common – low power consumption. The power supply in the original PC was rated at a mere 63 watts, so a power-hungry hard disk could easily over tax the supply.

Choosing one

THE CHOICE OF hard disk for a given application depends on two main factors – the performance which is required of the drive, and the type of machine to which the drive is going to be fitted. It's no use putting a fast 12 millisecond SCSI drive in a 4.77MHz PC – the drive will spend most of its time waiting for the computer to catch up to it. On the other hand, connecting an ST506 stepper motor drive up to a fast '386 machine is going to degrade performance markedly.

If you are adding a hard disk to an XT-class machine, then you'll not only need the drive itself, but also a controller to match. Buying the two together as a unit is the safe way to ensure that the two are compatible, but there are several universal hard disk controllers on the market that can be set up to control just about anything. Consider an RLL drive and controller if you need extra capacity – it could be cheaper than a conventional drive and controller of the same capacity.

With an AT machine, there will already be a controller built-in, probably with a floppy on the same board. Most standard AT controllers are ST506 numbers using MFM. It is advisable to choose a drive which is supported by the inbuilt BIOS drive table, otherwise you'll need special driver software to be able to access the drive's full capacity. Many retailers bundle such software with large hard disks, or at least make it available as an option.

Bear in mind that if you intend to add anything except a standard ST506 MFM drive to an AT, you'll need to replace the controller (unless your particular machine has some other form of controller, which is unlikely). Because the standard AT controller also handles the floppy drives, you should look for a replacement controller which has a floppy controller also, other-

Optimise your hard disk

OPTUNE IS A general-purpose hard disk maintenance package, capable of performing many functions such as file de-fragmentation, disk packing, and interleave optimisation. OPTune in not copy-protected, and comes on a single disk, containing the various files.

The file de-fragmentation operation ensures that each file on the disk occupies contiguous sectors. However, this mode does not remove any gaps which may exist in the disk space, which greatly speeds up operation of the program. It can also do a full disk optimisation, which removes any empty space as well.

OPTune can also determine the optimum interleave for a hard disk, and reformat the disk non-destructively. There are two modes of operation – 'safe' and 'quick'. Both modes are as safe as one another, provided power is not interrupted before the program has completed sorting the drive. However, the 'safe' mode trades speed for increased safety – it is only about half as fast as the quick mode – but if a power failure occurs mid-stream, OPTune can recover the disk entirely.

OPTune can also de-fragment the files on a hard disk, making it pretty much an all-purpose disk optimisation package. It also takes care of logical errors in the same way as DOS's *chkdsk* program, looking for unallocated clusters which are marked in the FAT as being 'in use' – so-called lost clusters.

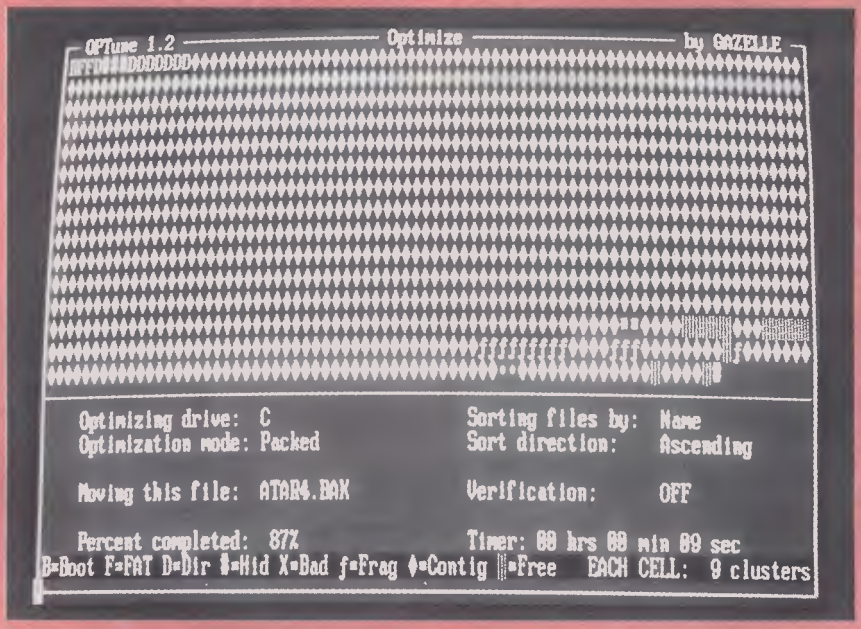
The file de-fragmentation function is particularly quick, with a 20Mb hard disk being optimised in as little as four minutes. There are three different types of disk optimisation, depending upon how much time is available to run the program, and what level of re-organisation is desired. *Normal* mode is the fastest form of optimisation, which de-fragments all the files on the disk, but makes no attempt at removing vacant spaces between files.

The *packed* mode also de-fragments files, but in addition it removes any empty spaces between files, moving all unused space to the end of the disk. This mode of operation naturally takes a little longer than the 'normal' mode.

The final mode is called *file realignment*. All the operations of the normal and packed modes are also performed here, with the added bonus of physically arranging the files in the same order as they appear in the directories. This speeds up access of sequential files in operations such as searching all the files in a directory for a particular item of text.

OPTune can also optionally sort the order of the files listed in all the directories on the disk, and sorting can be performed on the file's name, extension, date, or size, in either ascending or descending order. This sorting can take place in any of the three main operating modes.

OPTune is priced at $150, and is distributed by Sourceware on (02) 427 2777.



wise you'll have to buy a dedicated floppy controller card – wasting an expansion slot in the process. Either way, make sure that the new floppy controller can handle the floppy formats which you are using; most controllers these days can control all four common floppy formats.

There is another difference between XT and AT hard disk controllers, and this relates to the width of the data bus. It's easy to check visually, as an AT controller will have the extra little bus connector which set AT cards apart from XT ones. Beware of 'universal' cards which are said to work with both XTs and ATs, but don't have the full AT bus connector – they will work, but the data transfer rate between the CPU and the controller will be halved. Universal cards which do have the full AT bus are all right, since they can be configured to use either bus to its full potential.

When EISA becomes more popular, there will be yet another choice available – hard disk controllers are one peripheral

which will be able to take advantage of the wide 32-bit EISA bus.

The cost advantage of RLL drives over MFM for an AT can be seriously eroded by one factor not evident with XT machines – with an XT you have to buy a controller whatever type of drive you buy. An AT already has a controller, which you'll have to discard if you buy an RLL drive. Sure, you can use an RLL drive with an MFM controller with no ill effects; none that is, except that the final capacity will only be two-thirds the rated capacity of the drive.

The same criteria also applies to ESDI and SCSI drives – you'll have to buy a matching controller. ESDI and SCSI drives won't work at all with an ST506 controller, so don't even try. You might destroy something!

There are two other criteria which must be met when adding a hard disk to an existing system. The most obvious is physical space – there needs to be an empty drive bay of appropriate size in order to accommodate the drive. Many chassis designs have special dedicated hard disk bays, which do not have front panel openings. A hard disk may be mounted either vertically or horizontally, depending on the particular chassis design. Make sure, too, that the supplied cables are long enough to reach the drive bay from where the controller is located. It may be worthwhile re-locating some of the expansion boards in the system so that the drive controller is as close as possible to the drive itself.

The other thing to watch is the capacity of the system power supply. If you have an original PC with a 63-watt supply, then a low-power hard card may be the only alternative. Even then, a higher power supply may be a worthwhile investment – 150-watt XT style supplies are available which are a drop-in replacement for the 63-watt unit. This is especially important if you have a lot of expansion cards installed as well.

KEN COOPER/THE IMAGE BANK

The heads of a hard disk are mounted on a light-weight arm (to maximise stepping speed), and often 'float' as close as ten microns (thousandths of a millimetre) above the surface of the disk.

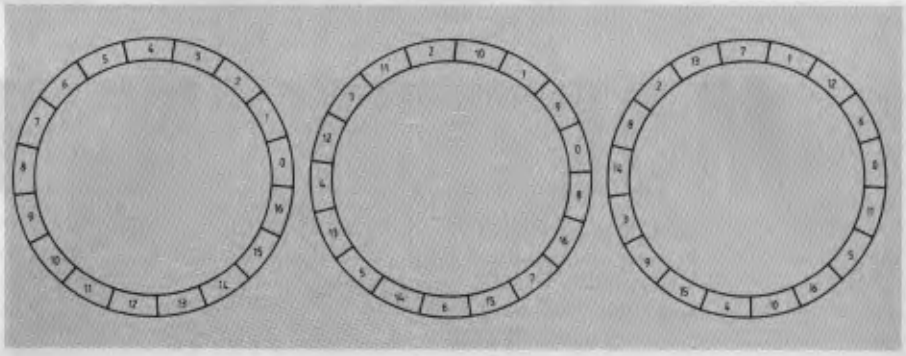


***Figure 2.** The arrangement of sectors on a typical hard disk track, with interleaves of 1:1 (left), 2:1 (centre) and 3:1 (right).*

Most XT machines have a 150-watt power supply, which should be adequate for most 'normal' systems (say, two floppies, a hard disk and several expansion cards). ATs usually have a 180 or 200 watt supply, which can cope with two hard disks in the one system. Special high-power supplies are also available in the AT form-factor (250 and 300 watt) from some suppliers, for file servers with, say, two high capacity SCSI drives, a CD-ROM, a full complement of expansion cards, and so on. Normally though, the existing supply will be adequate.

Replacing the power supply is usually just a case of removing all the connectors from the old one, unbolting it, and putting the new one in. Make sure that you get the motherboard connectors in the correct order, and around the right way – they are not polarised on some machines. If you do not feel competent to replace the power supply, ask the supplier of the new supply – he (or she) should be only too happy to do it for you.

Maximising performance

NO MATTER HOW fast your computer, and how good the drive and controller are, there always seems to be some way in which performance can be increased that little bit more. File fragmentation is a problem which arises on just about all hard disk systems, not just those running Dos. Files are deleted, new files are added, and files get split up to fit wherever there is space available.

When Dos needs to access a file, performance is greatly degraded if the heads need to jump all around the drive in order to collect all the bits of the file together. File de-fragmentation utilities search the entire disk for the various clusters of a file, and re-locate them so that they occupy contiguous clusters on the disk.

Other utilities can also adjust the interleave of a hard disk, without losing any of the data on its surface. If the interleave of a drive is set too high, a slight degradation in performance from optimum will be noticed, while the CPU waits for the next sector of the track to be read. However, this is nowhere near as bad as having it set too low. If the interleave is set too low, the processor has to wait for an entire disk revolution before it can read the next sector from its surface.

This is why IBM and other manufacturers tend to err slightly on the high side when setting the interleave on hard disks. However, the utility programs which can re-set the interleave actually measure the relevant system parameters very accurately, so that the interleave can be adjusted to the optimum figure for the particular machine in question. Two such programs are SpinRite and OPTune (see box items).

To get the most out of a hard disk, a worthwhile investment can be a set of disk utilities, such as the now-famous Norton Utilities and the Paul Mace programs. These include such things as disk optimisers (de-fragmenters), system information and performance checks, and file and directory recovery utilities.

Once you've used a machine with a hard disk, you'll wonder how you ever put up with floppies. Of course now it is not just a matter of having a hard disk, but one which is large enough to store all your data, and fast enough not to keep the rest of the computer waiting while the data is retrieved. □

WORD 5.0
MORE THAN PERFECT?

Word 5.0 has style – and everything else you need in a word processor, says John Hepworth!

FOR MANY YEARS, there have been clear leaders in most areas of IBM PC software. Like them or hate them, dBase and Lotus 1-2-3 have had the lion's share of their market since the inception of the PC. Simultaneously they set a standard to follow, and a target with which to compete.

In the word processing arena the situation is, and has always been, far more fluid. At first there were a host of messy little word processors, until WordStar 3.3 was ported from CP/M and became the standard for a while. Other players have come, made some sort of a mark, and faded.

Now there are two kids at the top of the tree. Microsoft Word 5.0 and WordPerfect 5.0 have between them a great share of the market, but neither has market dominance. Such competition is to the benefit of users, for the performance of both products is rapidly increasing, and getting ever closer to low-end desktop publishing.

I have taken an extended look at Word 5.0, after its long-awaited release. My verdict? It's the word processor that I will use for all my writing, articles, reports and programs. It's also my first choice for basic desktop publishing. It is easier to use and more cost-effective than packages like Ventura.

OS/2 and Dos

WORD 5.0 HAS a host of features, around forty of them are new. Most importantly, Word 5.0 supports both OS/2 and Dos, not as separate versions, but in the very same package. As spreadsheets and databases are already available for both environments, this allows users to work under Dos, one task at a time, or under OS/2 and switch from one application to another, and back again, at a moment's notice.

Word 5.0 drops straight into an edit screen. By default, a menu appears at the bottom of the screen, and a border appears around the screen. Either or both can be turned off, with the menu then only appearing when needed.

The various commands can be entered in three ways. Beginners will use the menu, with the escape key toggling the cursor between the edit area and the menu. The menu appears across the bottom of the screen, and each menu item has one letter capitalised. An entry can be selected by using the cursor keys to move a highlight and pressing Enter, or by pressing the key matching the capitalised letter. Alternatively, Word 5.0 uses function keys very effectively, and also has 'speed keys' which are the Alt key and an alpha key pressed at the same time.

Word 5.0 has followed a simple design philosophy through a number of versions. While other word processors require the user to insert 'tags' into the text, and move them as formatting has to be changed, Word 5.0 takes care of these details itself.

A document in Word 5.0 is subdivided in three different ways – characters, paragraphs or divisions. Both characters and paragraphs are self-explanatory, while a division is a major section of a document and can comprise many paragraphs or pages, and can even be the whole document.

Characters can be formatted with different typefaces and sizes, underline, bold, italic, strikethrough, uppercase, small caps, double underlined, superscript or subscript. Type faces and sizes depend on the printer, and with PostScript, sizes from 1 to 127 points are available in one point increments. Most importantly, when a document is created for one printer and another is selected at print time, without some of the type faces and sizes of the first, Word 5.0 will automatically select the font on the second printer that most closely matches that on the first, and adjusts line breaks and page breaks to suit!

Paragraphs can be left aligned, right aligned, centred or justified. Right and left indentation can be easily altered by menu or speed keys, as can hanging indents. Line spacing can be specified, or auto line spacing is invoked which sets the spacing of individual lines to the tallest character on the line. Side-by-side paragraphs can have different line spacings even on a dot matrix printer.

The various division formats include number of columns, margins and location of page numbers. A new division can now start anywhere on a page, and among other things, this now allows the top part of a page to have a different number of columns to the rest of the page.

One character, paragraph, or division can be formatted at a time, or many characters, paragraphs or divisions can be simultaneously formatted. The principle is that where one or more characters are to be formatted, they are highlighted by placing the cursor over one end of the block and simply stretching it to the other end of the block. They are then formatted by commands entered via the menu or speed keys.

Style sheets

FORMATTING CAN also be done via stylesheets. This powerful feature of Word 5.0 makes it a snap to create and reformat long documents. No longer does text have to be explicitly formatted, and tediously reformatted when the boss wants a global change like a different type face for all body text.

When using stylesheets, an author can set a style for body text, another for headings, yet another for titles and so on, and store them into a stylesheet file. One or more characters, paragraphs and divisions are then linked to entries in a stylesheet.

Change one of the entries in the stylesheet, and it will be reflected into the linked documents when printed. Imagine a situation where a whole swag of documents have body text in 12 point Courier, and a decision is made that the house style will in future use 10 point Times Roman. In most word processors you would have to go through the text of every document and manually change the character formatting.

You can also create side-by-side paragraphs in Word 5.0, and have newspaper-

style snaking columns. A document can be displayed on screen in three ways. The traditional way shows paragraphs in the order in which they appear in the file, not located as they will be on the printed page. A second mode, called Show Layout, shows the paragraphs approximately as they will appear on the printed page, with side-by-side paragraphs appearing on screen side-by-side and with a boxed outline for graphics which are linked into the document. In both of these modes, text can be edited, and while all characters are shown on screen in the same size, other attributes like italics, bold and underline are seen on screen.

Finally comes page preview. This shows one or two pages exactly as they will appear on the printed page, reduced in size to fit the screen. Even graphics are shown, though unfortunately zooming and editing is not available. The smallest text that can be read in page preview mode depends entirely on the monitor and video board used. On typical VGA and EGA screens, only the larger type will be readable, while the remainder is 'Greeked' to give an impression of the look of the final page. On very large screens, like the Viking 2/91, two A4 pages are shown side-by-side in almost exactly actual size, and text down to 8 points is easily readable.

Earlier versions of Word had more than one menu to set up the various options – these have now been combined into one Options menu. Most of the options are written out to disk when a session terminates, and are active in the next session.

Options

PREVIOUSLY THERE was more than one menu to set up the various options for Word 5.0. They have now been combined into the one Options menu, and can easily be changed. Most of the options are written out to disk when a session terminates, and are active in the next session.

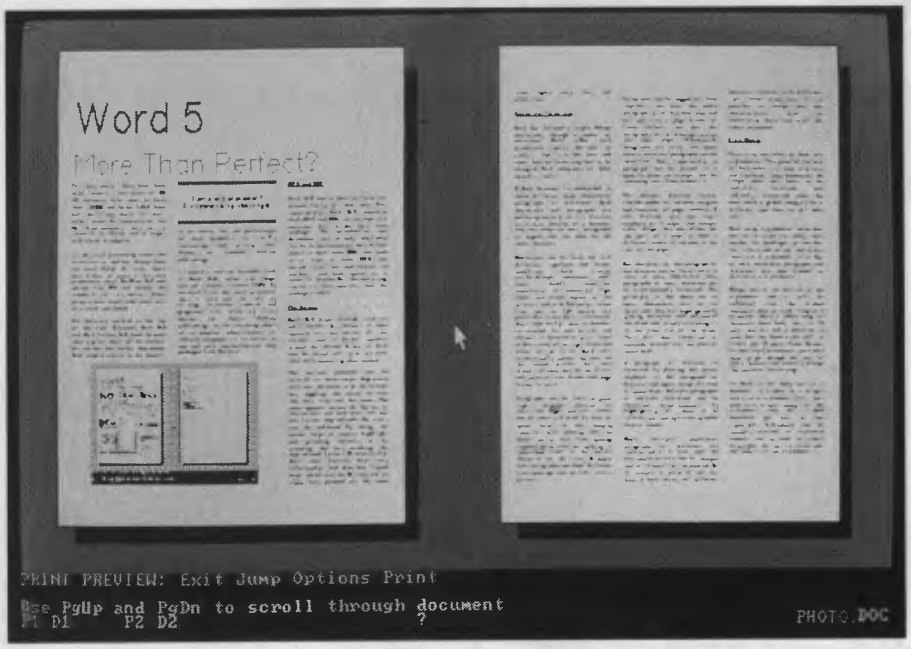
With the Word 5 program, and a series of link commands, you can link an external document, spreadsheet or graphics file into a Word 5.0 document. Link Documents can link a whole external document file or part of a file, Link Spreadsheets can link a whole spreadsheet, or an explicit or named range. Link Graphics can import, resize and print graphics images generated by PC Paintbrush .PCX, uncompressed TIFF B or G, Windows Clipboard, HPGL, direct or encapsulated PostScript.

A very effective screen capture utility comes with the package. It can grab graphics and text screens from most packages, including difficult ones like Windows, and thus allow them to be incorporated into a Word 5.0 document.

Word 5.0 drops straight into an edit screen. By default, a menu appears at the bottom of the screen, and a border appears around it. Either or both can be turned off, with the menu then only appearing when needed.

Tabs have been greatly improved when linking spreadsheets, and in any case tables are easy to create with left, centre, right, decimal and vertical tabs. Simple commands can also draw a box around a paragraph.

Running heads can be placed anywhere on a page. Multiple running heads can be created, and each can have several lines.



The review article mocked-up for PostScript – with a captured screen!

Alignment can be to margins or page, and the running head can be left aligned, right aligned, centred or justified.

Macros have been enhanced, and a standard glossary is included. Tables of contents and indexes are easy to create.

Multiple windows, on the same document or each with a different document, are a boon. Any one of them can be zoomed instantly to take the whole screen. Help and tutorials also come with this program. Help is excellent, with the index having around 90 entries. It is accessed either via the menu system, or by pressing Alt-H. Either way, it pops up a screen of help text, making some effort to give context sensitive help. A truly excellent on-disk tutorial is also included, and can be accessed from within the help system if required.

Spell checking has been improved and is now excellent, offering a good range of sensible alternatives when an unknown word is encountered. It defaults to checking the whole document, though if a block is highlighted it only checks spelling of text in the block. Lookup can be quick or complete. Standard, user and document dictionaries are supported, and an unknown but correctly-spelled word can be added to any of them.

Word 5.0 comes on either 5¼ inch or 3½ inch disks. Four manuals are included – *Reference to Microsoft Word* 260 pages), *Printer Information for Microsoft Word* (290 pages), *Using Microsoft Word* (640 pages) and *Sampler: An Idea Book* (110 pages). An envelope contains templates for a variety of keyboards, a 'road map' of initial guidance for the user and a pocket guide which serves as a quick reference. Also included is a 12 page 'newsletter' called 'The Latest Word'. This is a very professionally desktop-published document, entirely written and typeset in Microsoft Word, which lists all the new and enhanced features in this new version of Microsoft Word.

Hardware requirements

WORD 5.0 REQUIRES an 8088, 80286 or 80386 with 380K of RAM under Dos. A hard disk or floppies of 720K or more are needed. Speed is good on an 8088 for all functions except print preview, though even show layout can be a bit lethargic if complex formatting is involved. All functions are fast on 80286 or 386 machines.

Installation is easy, with an automatic program which works out for itself what video board is installed, asks which drive and directory and printer is used. It then completes the installation, prompting the user to change disks as required.

All the common video boards are supported, including CGA, EGA, VGA, 8514, PC 3270, Hercules and others. No driver for your uncommon board? Drivers for Word 5.0 for less common video boards and monitors, such as the Moniterm Viking 2/91, are often available from the hardware distributors.

The printer installation menu lists no less than 152 printers for which drivers are included in the package, and supplement disks are available from Microsoft with drivers for 59 more printers. Customising a printer driver is easy. Take the driver closest to the one you need. Convert the driver from binary to ASCII with the utility supplied. Modify the ASCII file as required, using a text editor or word processor, and then turn it back to binary with a new name. Full details of the procedure are included in the manual.

Conclusion

THE KNOCK-DOWN, drag-out fight between Microsoft Word 5.0 and WordPerfect 5.0 for best word processor moves to a new stage. Word 5.0 is a worthy challenger for the crown!

Any word processor can create a letter or memo in one typeface, with simple formatting. All support some sort of block moves and spell checking – so does Word 5.0. It is the ability to simply and easily create these entry-level documents, while also being able to create documents right up at low-end DTP that sets Word 5.0 apart, particularly with its style sheets and ability to easily and flexibly format and reformat a document to get the desired result.

Could Word 5.0 meet your entry-level desktop publishing needs, and also serve as a secretarial and writing tool? It does for me! □

Product Details

Product: Microsft Word 5.0
From: Microsoft
1 Skyline Pl,
Frenchs Forest 2086 NSW
(02) 452 0288
Price: $675 Microsoft Word 5.0
$275 for each additional network node

The knock-down, drag-out fight between Microsoft Word 5.0 and WordPerfect 5.0 for best word processor moves to a new stage. Word 5.0 is a worthy challenger for the crown!

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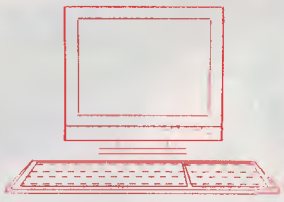

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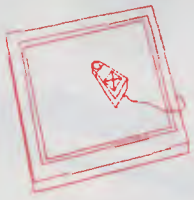

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AN ELECTRONIC BIBLE

David Parker provides testament to the worth of a computer in Biblical research . . .

A COMPUTER IS AN ideal tool to use when searching for words and phrases in a large volume of text such as the Bible. According to John J. Hughes in *Bits, Bytes and Biblical Studies*, the text of the King James Version occupies about 4.5Mb, and comprises of 14,000 different words that are used 789,000 times. Using compression techniques and indexing, it is possible to reduce this bulk to a size which is manageable on a personal computer (there is a set of 66 files – one for each book – containing the King James Version text in ASCII format available on public domain, but they have no searching or printing software).

However, to search this amount of data manually and to print out and store it is a cumbersome task (for example, a standard printed Bible concordance contains about 311,000 citations and extends to more than 1,000 large, close-printed pages). So it is not surprising that there are now a number of 'electronic concordance' programs available for use on personal computers. One of the most effective, and cheapest, is QuickVerse Bible Concordance.

QuickVerse allows you to search for any words or phrases or Bible references and to print out the results or store them on a disk file in a variety of formats. More than one phrase can be entered simultaneously using Boolean AND/OR searches, and wildcards are also supported. Word frequency counts can also be given, with or without a search for the words

When a particular verse has been located, it is easy to scroll backwards and forwards through the immediate context, or to the next previous verses meeting the same search condition. Opening verses of chapters and books may also be browsed with the touch of a key. It is easy to return to the last occurrence of the search phrase after browsing away from it – simply press the enter key! An alphabetical list of all the words in the Bible (with their frequency) can also be called up, and the search word can be selected from this list.

Any of the three most popular English versions of the Bible are available – King

James, Revised Standard and New International. More than 40 different printers are supported, but Escape codes for others can be programmed into QuickVerse in the configuration process. The program is not copy protected, but it is copyright protected, a fact which users cannot ignore if they read the opening screen.

Easy use

QUICKVERSE IS easily installed. The manual (and help menus) provide clear and relevant information just as it is needed. For example, each chapter of the manual contains a summary section headed 'In a Hurry?' which allows experienced users to install and operate the program with a minimum of fuss. The program itself is menu controlled, but it also makes full use of function keys for speed and efficiency.

Program operation is fast. For example, on my 12MHz XT, searching for a word or phrase found only in the last few verses of the Bible, or calling for a reference in the last chapter, is virtually instantaneous when the program is used in its fastest mode. In the slower mode, it only takes two to three seconds, which is more than satisfactory in most cases.

QuickVerse version 1.2 comes on eight floppy disks – two program disks, four Bible text disks, and two concordance disks. To install the program on a hard disk machine, it is simply a matter of placing the first program disk in drive A, logging on to the hard disk root directory, and issuing the command –

```
A:LOAD A: C\QV
```

– this will create a sub-directory named QV on the hard disk and transfer the files across as you insert disks in Drive A in response to prompts on the screen. When installed, QuickVerse combines the Bible text files into a single 1.3Mb file. There are also concordance and word files containing every word in the Bible, together with indexes and usage count files occupying about 900K. The program, help, and some miscellaneous files, comprise a further 170K, thus the total disk space is 2.5Mb.

The program is run by issuing the command /QV (with or without the three switches: /M for memory conservation – this gives a shorter load time, but lengthens the search time; /L for a mono monitor with a CGA card; /C to clear the verse window for each new search). If a printer is attached but not ready, a warning is given,

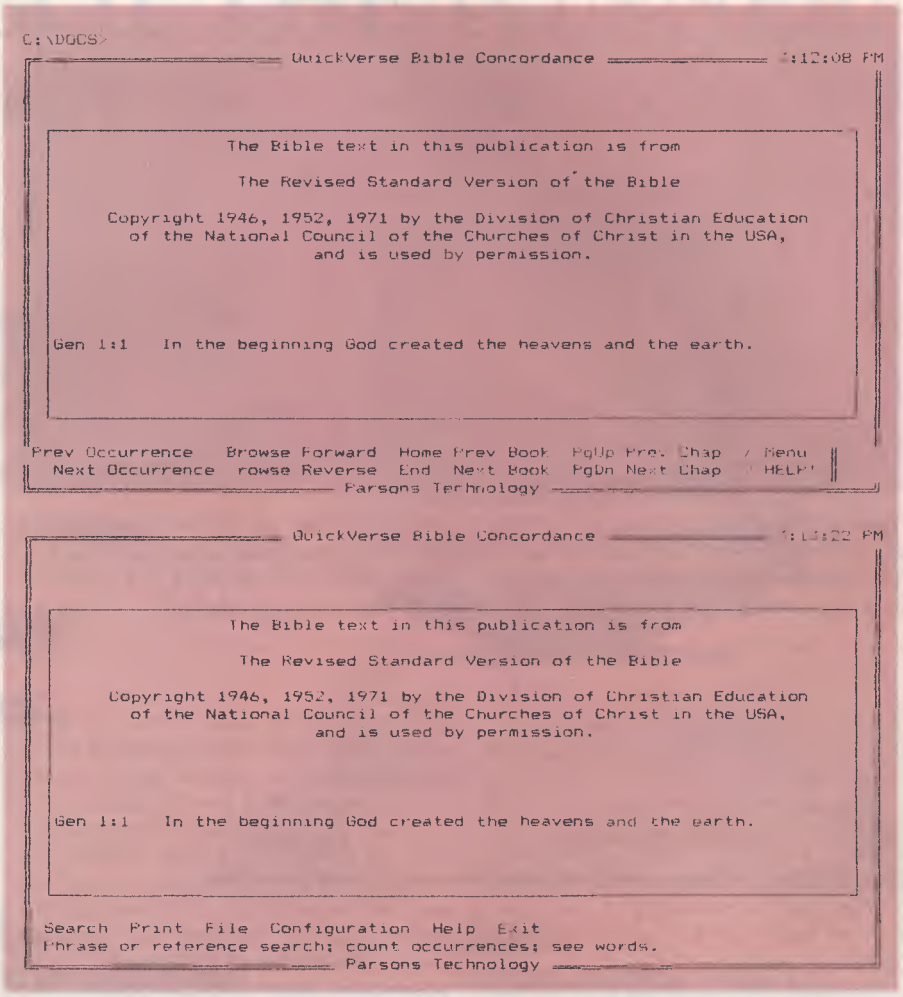

Figure 1. *QuickVerse's opening screen (top) displays the first verse of the Bible and lists the options along the bottom of the screen. The Help Menu is a five-page summary of the main commands and includes some useful hints and tips. The /Menu (bottom) is used for Searches which can be based on a word or phrase (for example, 'Adam', 'bapti*' or 'Jesus said') or by a reference to chapter and verse (for example, Romans 3:23). Using Boolean operators, multiple phrases or references can be entered.*

but it can be over-ridden. After the license information is presented, the opening screen displays the first verse of the Bible (together with copyright information about the particular Bible version in use), and lists the optional commands along the bottom of the screen – see Figure 1

To initiate a search, the Enter key is pressed while the highlight is on Search, or the initial letter, S, may be pressed instead. This option allows for a search by word or phrase or by a reference to chapter and verse. The options Phrase (including 'word') or Reference are selected according to choice (/SP or /SR).

The search condition is finalised by pressing Enter; in the case of word or phrase search, there is a delay while QuickVerse checks the word list to verify that the selection is valid before returning to the sub-menu; if not, a warning is given. To assist in selecting valid words, a list of all the words in the Bible can be displayed by using the Word option (/SW) or by pressing F1 at the search window.

It is possible to restrict the search for a word or phrase to a particular part of the Bible, for example, Matthew-Revelation for the New Testament only, by using the 'limits' option (/SL). By selecting 'count'

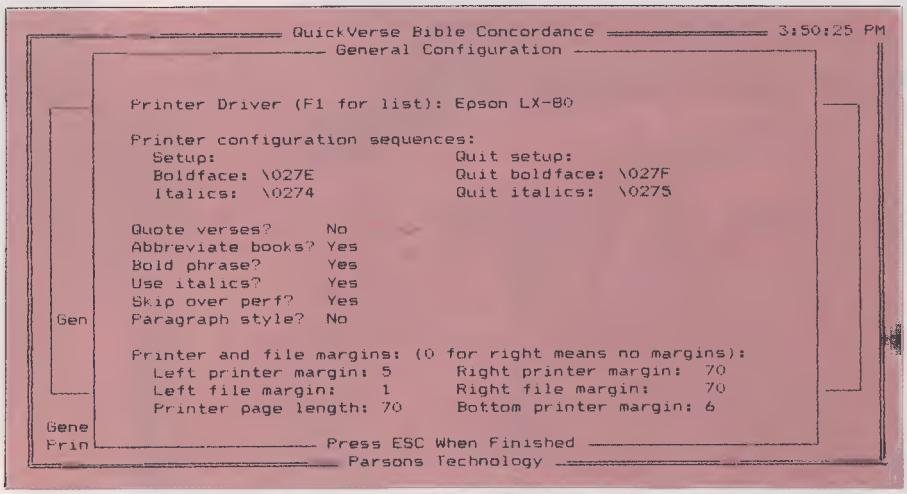

Figure 2. *The program offers a useful range of printing options. As well as those shown here from the General Configuration menu, the Biblical reference (book name, chapter and verse number) can be printed before or after the text of the verse or not at all. The format for screen display, disk file and hard copy can all be individually configured.*

(/SC) you can display the number of occurrences of the search word without actually listing them.

When the search parameters are finally set, select the 'go' option (G). The search menu is replaced by the opening menu and the first verse meeting the condition is displayed in the centre of the screen with the search word or phrase highlighted.

The most serious limitation of the version I originally used is the lack of a window facility for pasting data to a word processor. But, I have recently tested a pre-release copy of the next version, and this problem has been effectively addressed, although it does occupy quite a bit of RAM (152K), which means I cannot use extras such as a dictionary on my word processor.

One of the many attractive features of QuickVerse is the way in which the format for printing and saving to a disk file may be varied. There are many choices, and they can be selected easily while engaged in a particular search session.

The selection is carried out in the 'configuration' sub-menu (/C) which has two further sub-menus. The 'general configuration' (/CG) menu sets up the printer driver either from a selection of those already available, or by entering in the escape codes for deinitialising the printer (if relevant) and for boldface and italics. Boldface is used in the printout to highlight the search phrase, while italics are used for the King James Version to show words which are not in the original text of the Bible but were supplied by the translators for purposes of English style.

Other options relating to the printer format are margins and page lengths. The format of the Biblical text on the page can also be varied widely. For example, the verses can be enclosed in quotation marks, and names of Bible books can be abbreviated. Another useful option is the 'widow/orphan' control which prevents a verse being split across two pages – see Figure 2.

Summary

IN SUMMARY, QuickVerse Bible Concordance lives up to its name – it is easy to install and use, fast, flexible and includes a clear manual (a Macintosh version is also available). My copy was ordered by phone using a toll free number while in the United States in mid-1989. Service was courteous and prompt, with the package arriving in less than two weeks.

More comprehensive packages, such as the WORD Processor from Bible Research Systems in Texas, is currently being offered in Australia at well over five times the price I paid for QuickVerse, while CompuBible from NASSCO, also from Texas, costs more than four times as much.

CompuBible does not appear to be as easy to install or as compact, but it does offer two distinct advantages. First, more than one version of the Bible can be used, selectable by menu. (One is included in the price, with a total of five being currently available; extra versions cost about the same as QuickVerse itself. They are even more expensive for The WORD Processor.) Despite the cost, keen Bible students who are working at the level offered by an 'electronic concordance' will find this a useful facility. Secondly, CompuBible has an additional module called Genesys which is a memory-resident windowing device allowing full operation of CompuBible from within another program. This is particularly handy when using a word processor for writing a document in which Biblical quotations are needed. When you are editing the document, pressing the Genesys hotkey will activate CompuBible and allow a search to be made. The results of the search can then be transferred back into the word processor document and the Genesys window closed off.

Packages such as QuickVerse and CompuBible are useful for those who are working with the English text of the Bible. However, scholars and professional Bible students need access to text in its original languages – Greek and Hebrew. Programs for the personal computer that handle Greek and Hebrew are now becoming accessible.

There are a number of highly sophisticated projects in progress where scholars are using main frame computer techniques for high level studies of the Biblical and related texts. The future for computerised Bible research looks good, and QuickVerse Bible Concordance is an extremely cost effective way in. □

Product Details

Product: QuickVerse Bible Concordance
From: Parsons Technology
375 Collins Rd,
Cedar Rapids, Iowa 52402 USA
(1800) 223 6925
Price: US$49 plus $5 shipping/handling.
(We understand an Australian distributor is to be appointed shortly.)

QuickVerse Bible Concordance lives up to its name – it is easy to install and use, fast, flexible and includes a clear manual (a Macintosh version is also available).

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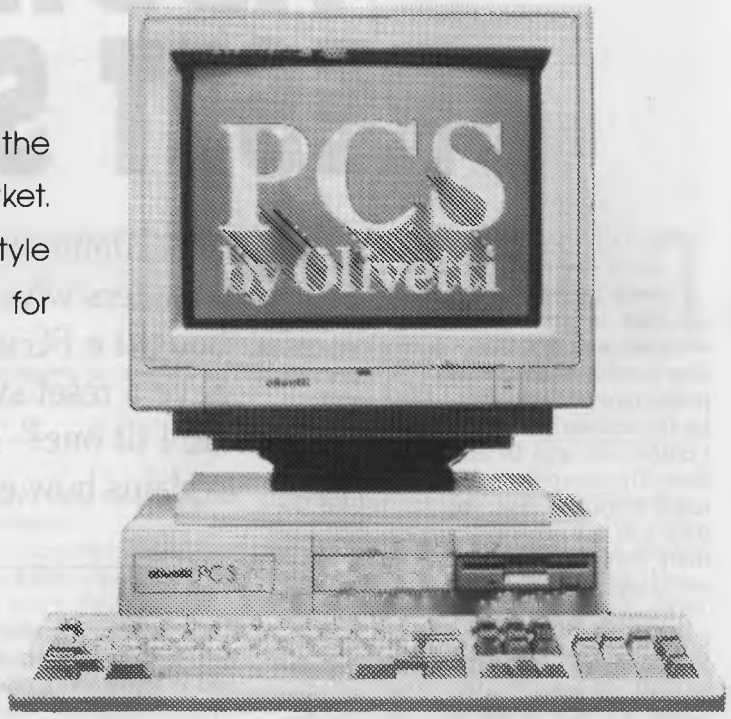

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ADDING A RESET SWITCH

A common cry from readers who have just bought a PC is 'It doesn't have a reset switch – how do I fit one?' Tom Moffat explains how easy it is . . .

IF YOU DO MUCH programming, you'll see the immediate worth of a reset button. When you make a mistake in your program, you usually wind up with a crash of some kind; you lose control of the computer. You can normally recover from these little incidents by the software reset method of pressing Control, Alt, and Delete, all at the same time. The computer beeps, the system reloads from the disk, you can reload the files you are working on (you did save them before running the program, didn't you?) and all is ready to try again.

However, if you're not so lucky you may discover that the crash has disabled the keyboard, so everything, including the Ctrl-Alt-Del combination, is ignored. This occurs for one of two reasons. The keyboard generates an interrupt whenever any key is pressed. (Interrupt: a microprocessor feature that forces the main program to drop what it's doing when some prearranged external event occurs. The external event is attended to, and then normal program execution resumes where it left off.)

The keyboard interrupt sends the microprocessor off to an area of low memory where it expects to find the address of the machine code routine that handles the incoming code routine that handles the incoming data from the keyboard. If this memory area has been corrupted by the crash (a common occurrence), the processor goes spinning off into never-never land. Result: no keyboard. The keyboard also gets zonked if you've temporarily disabled the processor's interrupt function as part of your program, and then the program crashes. No interrupts – no keyboard.

The traditional way to recover from loss of keyboard is to reach for the Big Red Switch and turn the whole computer off, and then on again. It works, but isn't really good for the computer, or the monitor. In fact, it isn't really wise to switch any electronic device off and on unnecessarily, even a TV set. It stresses the components, and in particular picture tubes.

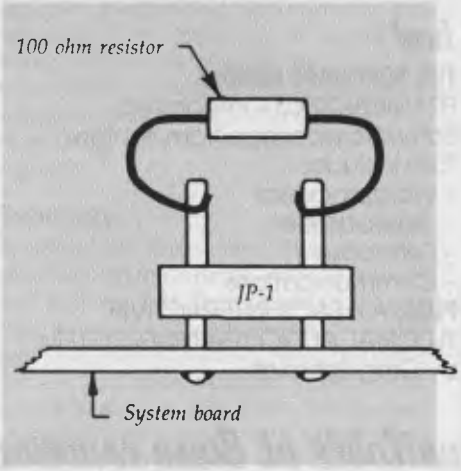

Figure 1. *To test if a reset button can be fitted to your computer, fire it up with the cover open. When it's all properly booted and sitting there waiting for action, take the 100 ohm resistor in your fingers and carefully bridge it across the connector pins. Don't worry about getting electrocuted, the voltages here are very low. If all is well, when the resistor makes contact, the computer should beep, spin its disk and reboot.*

Most computers in the past had some type of button that could be pressed to restart the computer from scratch without needing to turn it off and on again. But IBM apparently didn't see a need for this, and instead opted for Power On Reset which would only occur when the machine was first switched on. However, many makers of IBM compatibles have seen the light. They haven't installed hardware reset buttons as such, but they have put circuitry on their system boards to allow easy installation of a hardware reset.

Minor surgery

TO MAKE USE of this facility you will have to perform some minor surgery with an electric drill and a soldering iron. But before you do anything, it's necessary to find out if the system board on your computer has been pre-wired for a reset button. I have been involved with two IBM compatibles, and I've been able to put reset buttons in both. The first machine, which belonged to a former employer, quickly became known as a Brand X. This machine made its way into Australia via Taiwan, Hong Kong and New Zealand, and it appeared to be thoroughly illegal. It had exact copies of the IBM ROM memory chips, including Basic-In-ROM (that's a definite no-no). And the circuit boards, case, disk drives, everything, were totally devoid of serial numbers or even maker's names. It was as if the computer had just fallen to Earth from outer space.

The other machine, the one I use now, is a Unitron. This company has produced both Apple and IBM compatible machines. They are very popular in Tasmania, particularly among government users, they're priced right, and well supported by their dealer. But they seem to be a mystery in the rest of Australia for some reason. Both machines are housed in the standard big steel IBM type case, with a bonnet that opens up like in a car so you can get inside and fiddle around.

The interesting point is that the Brand X and the Unitron appear to have very similar system boards. They could have come out of the same factory. The Brand X system board takes 256 kilobytes of memory and you need an extra card to expand it. The Unitron takes a full 640K on the system board; no extra card is required. But in the area around the card slots and logic chips, they seem to be almost identical.

The traditional way to recover from loss of keyboard is to reach for the Big Red Switch and turn the whole computer off, and then on again. It works, but isn't really good for the computer, or the monitor.

And they both have easy connections for reset buttons. Similar system boards seem to be fairly common in other brands of compatibles as well. So you could very well be in luck. To find out if you can easily add a reset button, remove the cover from your computer, or open the bonnet if it has that type of case. Now look just behind the rightmost card slot and see if there is a little connector with two pins sticking straight up. It may be marked JPI. If it is present, success is likely, and it's time for a trip to an electronics shop. You will need to buy the following:

1 normally-open push button switch;
1 100 ohm resistor (1/4 watt will do);
1 meter of multi-conductor ribbon cable;
8 Molex pins (you only need two, but you may wreck some);
A bit of plastic tubing that will fit over the Molex pins.

To save further money you should now find a friend who's into electronics, and borrow the following:

A small soldering iron and some solder;
An electric drill, with a bit to fit your push button;
Side cutters and long-nose pliers;

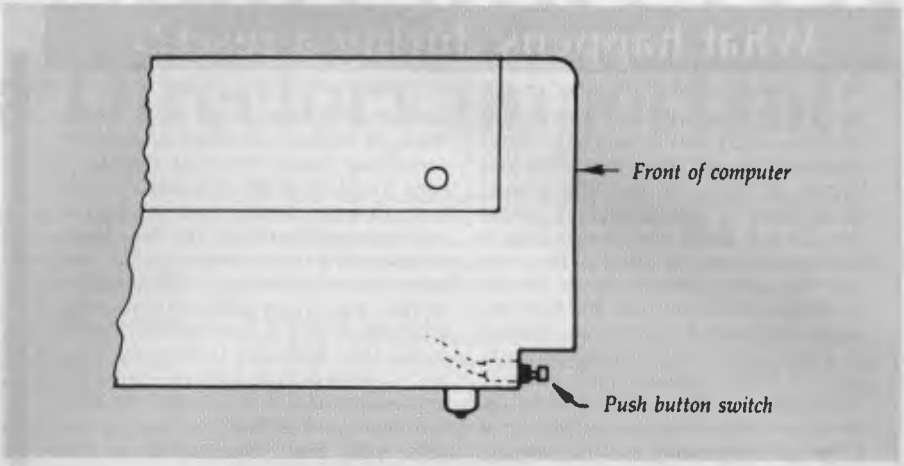

Figure 2. *On the Unitron, the reset button was mounted near the front left side of the computer – it was necessary to temporarily remove the speaker bracket to do this, but it made a nice neat installation.*

The friend (who might enjoy watching you drill holes in your computer).

Now back to the computer. Fire it up with the cover open. When it's all properly booted and sitting there waiting for action, take your 100 ohm resistor in your fingers and carefully bridge it across the two pins of the connector you found earlier; one wire to each pin. Don't worry about getting electrocuted, the voltages here are very low. If all is well, when the resistor makes contact the computer should beep, spin its disk and reboot exactly as if you had used Ctrl-Alt-Del on the keyboard. The computer may not conduct its power-on memory test; it depends on the brand of computer.

If this test works, try it again, just to make sure. If the test doesn't work, that is, if nothing happens when you bridge the connector with the resistor, then the easiest course would be to give the whole project a miss. It could be that the little connector has some other purpose in your computer. We used the resistor to test it, instead of a bit or wire, so the resistor would act as a 'safety valve' if it shorted the wrong thing. But if the connector is there, in the right place, you would have to be pretty unlucky for it not to work!

Where to put it!

IF ALL IS OKAY, you must now decide where you want to mount the reset button. In the first of these modifications I made, to the Brand X computer, I found two blank plastic panels, right on the front, that could be removed to allow the installation of extra disk drives. I simply drilled a hole in one of them (dead easy) and mounted the switch there. The only trouble was, it was very visible, and people would come along and say 'What does that do?' and then press it (*groan*). The computer would of course, reboot, sending some bit of a WordStar file or something off into oblivion. Not a good idea.

The Unitron installation was a bit more discreet. This machine's case has its main front panel protruding a few millimeters over a smaller surface near the bottom. The button was mounted on this smaller surface where it is somewhat hidden by the larger overhanging front panel. The spot chosen was near the left hand side of the computer. See the side view in Figure 1. It was necessary to temporarily remove the speaker bracket to do this, but it made a nice neat installation. A third option would be to mount the switch on the rear of the computer, where you could find it by feel.

Before doing any work on the computer, be sure to remove the power cord from the mains socket, and for double safety remove cables to monitors, printers and so on, so you can have free access to the main system unit. Also, beware, if drilling in the steel cabinet, do not let any filings get into the computer's works. Protect the area with plastic bags and masking tape and make sure it's absolutely clean afterwards.

Wiring

NOW TO THE EASY part, wiring it up. With your fingernails, separate two strands of the ribbon cable from the rest. Measure

What happens during a reset?

THE RESET CIRCUIT is one of the most extensive in the IBM PC and most other computers as well. When you press that button, or when the machine powers up, a pulse is generated that propagates to just about every major chip in the machine. In the IBM PC, it comes into the main microprocessor on pin 21, which goes briefly high and then low again. This causes the program counter to begin executing instructions from address FFFFO (hexadecimal) which is 16 bytes below the top of the PC's 1 megabyte addressing capability. (In a CP/M computer using a Z80 processor, execution starts at address 0000 after reset, the opposite end of memory. How about that!)

There just happens to be a ROM chip in the IBM's highest address space; in fact it occupies the top 8K of addressable memory. This is generally referred to as the Boot ROM or the BIOS ROM (basic input/output ROM) and if you look inside the computer you'll find it sitting in socket near the middle of the system board.

The sixteenth instructions from the top will tell the microprocessor to jump somewhere lower in the ROM where there are instructions which actually do something useful. The first that happens in called POST or Power On Self Test. This checks the memory, figures out how much there is, and then tests various slots and connectors to see what else is hooked up to the computer. If all is okay, the ROM software energizes the default disk drive which reads in the Dos. With Dos in memory, control is passed to it, sign on messages appear, you're asked to enter the date and time, and at last the Dos prompt tells you that your wish is the computer's command.

At the end of the memory test, the BIOS Rom writes '1234' into an area of low memory. Then, after a software reset (Ctrl-Alt-Del), the BIOS checks for this value in that location, and if it is there it bypasses the memory test, saving lots of time. Upon hardware reset (your new button), the BIOS may or may not take into account the '1234', depending on what version of BIOS you are using. This explains why some computers do the full memory test on reset, and others don't.

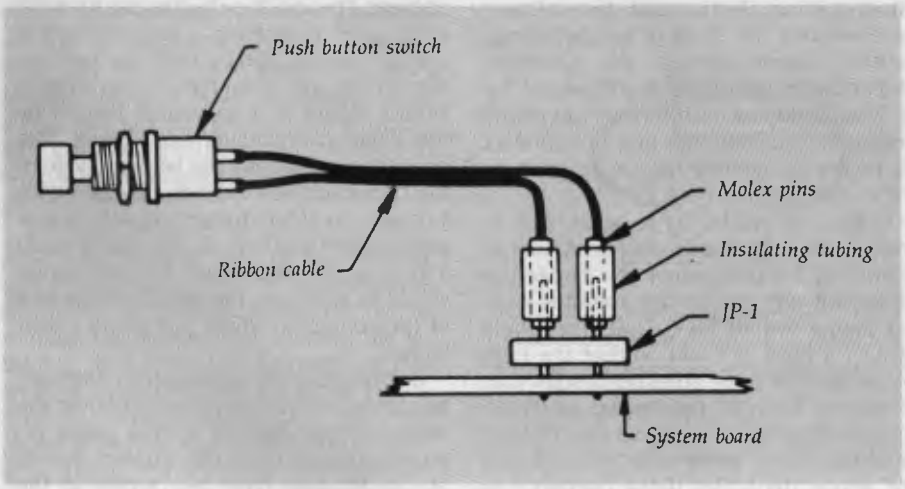

Figure 3. *After measuring out enough wire to make it from your chosen button position to the connector on the system board, solder one conductor to each lug on the button; then install the button in its hole. On the other end solder a Molex pin to each wire.*

out enough wire to make it from your button position to the connector on the system board. Leave plenty of slack so the wire can be neatly run beside or under the circuit boards. Referring to Figure 2, solder one conductor to each lug on the button; then install the button into its hole. On the other end, solder a Molex pin to each wire. Molex pins are really meant to be used in home-made circuit boards as makeshift integrated circuit sockets, but they slide nicely over the little pins sticking out of the system board as well. The idea is to avoid the need to solder directly to the system board pins.

Once the Molex pins are on, slide a bit of your plastic tubing over each one to prevent them shorting against each other, and then slide one Molex pin onto each of the system board pins (use your long nose pliers for this). You can toss out the 100 ohm resistor – that was only for the initial trial to see if the system board connector was what it appeared to be.

When the program was run, the screen filled with flashing rubbish, both disk drives lit up and started spinning, and the speaker made a noise like 'guk-guk-guk'.

Smoke test time. Restore the power cord, make sure your monitor is hooked up, put in your Dos disk and switch on. The computer should fire up as normal and eventually sit there on the Dos prompt waiting for something to happen. Well, it's now in for a shock. Press your new button and the computer should beep and Dos should reload, just as if the machine had been switched on. Remember, there may or may not be a memory test. On the Brand X, I discovered that a short jab on the button would reboot without the memory test, but if I held it down for half a second or so it would start the memory test from scratch. I have never figured out why this happened.

You will find your new reset button valuable. I certainly have! For what it's worth, the mightiest crash I ever caused on an IBM came about when I was experimenting with the counter/timer chip, writing commands directly into it. Because of a simple typing error, the commands went somewhere else. When the program was run, the screen filled with flashing rubbish, both disk drives lit up and started spinning, and the speaker made a noise like 'guk-guk-guk'. And of course the keyboard failed. But the trusty reset button brought it all back to life. □

NEW THE ENCYCLOPEDIA OF SHAREWARE

What is Shareware...
and why is a Directory important?

How it works

Shareware relies upon the honesty of software users to pay for the software that they use.
Shareware bypasses the costs associated with conventional marketing and promotion of software by inviting users of software to give copies of the software to their friends.
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Rather than implementing cumbersome copy protection schemes shareware authors do exactly the opposite — they actually encourage their users to make copies of the software for their friends.
Word would spread slowly if the author solely relied upon users just sharing copies with their friends. User groups are encouraged to share the software with their members on a non profit basis.
Many user groups set up Bulletin Boards so that members can "down load" software which they would like to evaluate for use. This is another accepted way of distributing shareware.
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What is the difference between Shareware and Public Domain Software?

Public Domain software is created by authors who chose not to seek formal rights or royalties. There is no restriction of any kind on distribution of this kind of software. Most public domain software is games or utilities. There are very few complete products in the public domain.
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Shareware is an alternate method of marketing software, not really a different kind of software. In fact the more successful Shareware products hold their own against their commercially distributed competitors. The greatest difference is that the Shareware product's packaging is not as fancy and the price is much lower.

Where can I obtain Shareware trial disks?

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Do I need to join a Library?

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KEYPAD FOR THE PC

Peter Williamson describes a simple interfacing project to implement a four button keypad for 84-key PC-compatibles – or, a computer aided exercise package!

WHILE THE 8250 asynchronous communications adapter found on most IBM-type PCs is most commonly used to transfer data between computers and peripheral devices, it can also be used as a general purpose I/O port providing three outputs and four inputs. This is enough I/O to allow the monitoring of four switches and opens the door to some interesting interfacing projects which are safe and require a minimum of hardware.

One of the problems with IBM PC type keyboards is that they do not allow easy use of both the numeric keypad and the cursor control keys. Early keyboards required the toggling of the Num Lock key, and the 101-key 'enhanced' keyboards require movement of the hand away from the numeric pad 'home' (5) key in order to operate the cursor control keys. Both keyboards make it extremely difficult to enter numbers with one hand and exercise cursor control with the other.

This problem can be remedied by constructing a simple, four key, custom keypad which can be operated by either hand and is active regardless of the Num Lock state. All you need is a serial port, four Single Pole/Single Throw (SPST) normally open switches, some cable, a D25 plug, a box and the TSR program in Listing 1. The *normally open* switches are connected to the modem control pins of the serial port as shown in Figure 1. When a switch is closed it will connect the DTR line to the respective modem control input. The state of these inputs, and consequently the state of the connected switches, is obtained by reading the Modem Status Register (MSR) of the 8250 async controller.

Once a switch closure is detected, all we have to do is to cause an appropriate action to take place, which in the case of our custom keypad is to stuff cursor control key scan codes into the keyboard buffer. From the keyboard buffer they can be picked up by most software, including Dos.

The detection of switch closure and the placing of scan codes into the keyboard buffer is taken care of by Kpad.exe (Listing 1) which is hooked into interrupt 08 hex and activated every clock tick (approximately 50ms).

Building the hardware

THE REQUIRED hardware is constructed from easily available parts, obtainable from any of the popular electronics supply houses, and requires a minimum of skill and tools. A plastic 'jiffy

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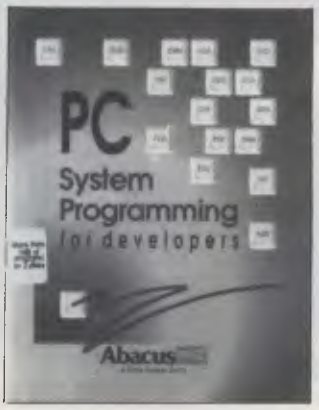

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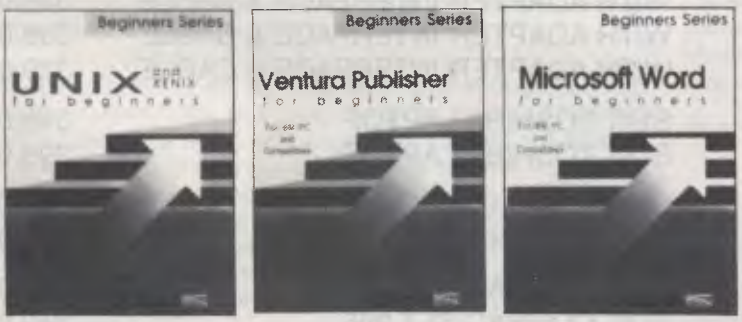

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box' is the recommended way of mounting the switches – they're cheap, look reasonable, and you can readily work with normal hand tools. You can even drill the holes with the soldering iron if you're desperate. If you don't want to go to the trouble of buying a box, and don't mind the job looking a bit agricultural, a piece of scrap plywood or aluminum will do the job.

There is a bewildering array of cable designed for serial communications. It comes in many flavors, shielded and non-shielded, with and without twisted pairs, low and high capacitance, and so on. It is also generally expensive and difficult to work without the appropriate tools. Unless you plan to use the keypad in the next room, I would suggest that you use ribbon cable. It's cheap, easy to get, and most important of all, it's easy to use. A pair of lever type nail clippers strips the stuff like magic.

First decide on the size and layout of the switches. A good starting point for layout is to copy your existing keyboard's cursor control diamond, and most of the retail electronics shops offer a wide array of small push button switches (make sure that the switches are the normal open, momentary action, type). Once you have decided on the layout and have obtained the switches, drill the box or piece of plywood or whatever and install the switches. Connect them and the D25 plug as shown in Figure 1. Check the wiring to make sure all is per the diagram and plug the thing into COM1:. The computer should function normally, if it doesn't – switch it off, unplug the keypad and check your work again.

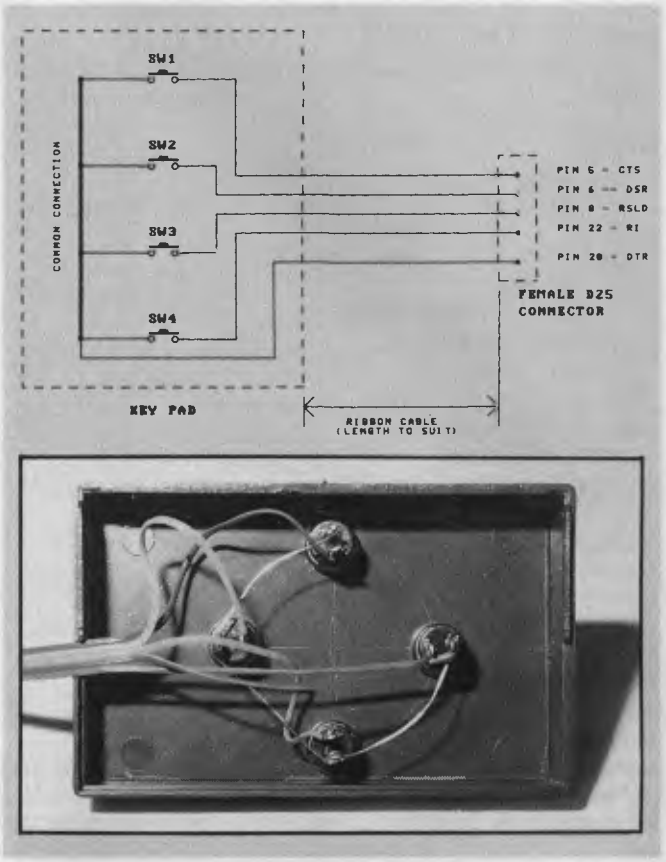

Figure 1. One of the problems with IBM PC type keyboards is that they do not allow easy use of both the numeric keypad and the cursor control keys. This problem can be remedied with a simple, four key, custom keypad – it can be operated by either hand and is active whether Num Lock is on or off. All you need is a serial port, four push buttons, some cable, a D25 plug, a box and the program in Listing 1.

Software

THE TERMINATE AND stay resident software uses straight forward techniques to redirect the tick interrupt, achieve residency, handle the interrupt when it occurs, poll the 8250 registers, and fill the keyboard buffer. A look at the listing tells all.

As mentioned earlier, the basic technique is to check for a switch closure every time an interrupt 08H occurs, by examining the MSR of the 8250 async controller and then to place the codes for the arrow keys in the keyboard buffer. The technique works well except for a little problem of response time.

In order to register a single key press you would have to close and open a switch in the time between tick interrupts. Since this is approximately 50ms, and I defy anyone to press and release a push button in less than 50ms, what in fact happens is that multiple interrupts occur during a button press and this results in a stream of characters being placed in the keyboard buffer. To remedy this situation, the software only places characters in the keyboard buffer when a switch is detected closed for a set number of tick interrupts. The double word variable set count controls this. The bigger the number in set count, the slower the response and vice-versa.

The 'proper' fix for the response time problem is to implement the typeamatic and key release detection features of a real keyboard. An exercise for the reader perhaps?

There is also one other tiny problem which as yet I have no solution for. This is the problem of preventing multiple loads of resident software. The Kpad software listed handles attempted multiple loads by looking for an ID string stored within the resident software. This works fine *if* the program is loaded last. If any other TSRs are loaded after it, then it cannot find the ID string, assumes all is OK, and promptly loads another copy.

The software was written for COM1. If you want to run it using COM2, you will have to change the port addresses and re-assemble it. Although the original was assembled and linked using Borland's Turbo assembler and linker, Microsoft's assembler and linker should also do the job as I have written the source in MASM format rather than Borland's IDEAL, and used standard rather than simplified segment directives.

```
                page   66,132
; KPAD.EXE Vers 2.1
;
;Assembled with Turbo Assembler Version 1.0
;Linked with Turbo Linker Version 2.0
;Written for COM1:
;(c) Peter Williamson 1989
;-----------------------------------------------------------------
;
                MASM                            ; TASM directive
forcing
                                                ; MASM mode !!!!
buffer_head     equ     001ah
buffer_tail     equ     001ch
```

```
speaker         equ     0061h
;
; Macros
;
DATA_SEG                MACRO
        push    cs
        pop     ds
                        ENDM
PUT_MSG                 MACRO   MESSAGE
        DATA_SEG
        mov     dx,offset MESSAGE
        mov     ah,09h
        int     21h
                        ENDM
code            segment para
                assume  cs:code,ds:code,ss:code,es:nothing
mainprog        proc    far
                jmp     inits
buffer_start    dw      001Eh   ; offset of keyboard buffer -
seg=040h
buffer_end      dw      003Eh
tick_offs       dw      0       ; location of previous timer tick
tick_seg        dw      0       ; int handler
port_val        db      0       ; temp storage of async port
value
ident           db      'PW'    ; identification string
count           dw      0       ; internal counter
on_flag         dw      1h      ; 0=don't execute, 1=execute
set_count       dw      2h      ; num of ticks before accepting
new
                                ; input
; Chain to previous timer tick handler by simulating
; an interupt.
handler:
        pushf
        call    dword ptr cs:tick_offs
; Save environment
        irp     reg,(ax,bx,cx,dx,es,ds,si,di,bp)
        push    reg
        ENDM
; Change cursor shape to signify on
        mov     cx,0407h                        ; CH=start line,
CL=end
        mov     ah,01h                          ; cursor size •
        int     10h                             : video service
int
; Read the async port and determine
; if a button has been pressed
        mov     dx,03fch                         ; turn on DTR
        in      al,dx                            ; and RTS
        or      al,03h                           ; if not on ND
detection
        out     dx,al                            ; possible
        mov     dx,3FEh                          ; MSR is port
3FEh
        in      al,dx
        and     al,0f0h                          ; Hi 4 bits only
req
        cmp     al,00h
        jne     pressed
        jmp     ende
; Return form interupt
; ALL exits should go through here
ende:
        irp     regs,(bp,di,si,ds,es,dx,cx,bx,ax)
        pop     regs
        ENDM
        iret
pressed:
        mov     cs:port_val,al                  ; temp store
; Slow down the response time
        mov     ax,cs:set_count
        cmp     ax,cs:count
        je      do_it
        inc     cs:count
        jmp     ende
; Determine what char to load into the buffer
; Bit patterns dependant on switch connection
do_it:
        mov     al,cs:port_val
        cmp     al,010h                         ; CTS (5)
        je      sw_1
        cmp     al,040h                         ; RI (22)
        je      sw_3
        cmp     al,080h                         ; RLSD (8)
        je      sw_4
        cmp     al,020h                         ; DSR (6)
        je      sw_2
        jmp     ende
; AH = scan code in hex
; AL = ASCII code (00 for special keys including arrow keys)
sw_1:
        mov     ax,4800h                        ; up arrow
        call    fill_buff
        jmp     ende
sw_3:
        mov     ax,5000h                        ; down arrow
        call    fill_buff
        jmp     ende
sw_4:
        mov     ax,4b00h                         ; left arrow
        call    fill_buff
        jmp     ende
sw_2:
        mov     ax,4d00h                        ; right arrow
        call    fill_buff
        jmp     ende
fill_buff       proc        near
; Set up BIOS data segment -- where the kbd buffer is
        push    ax                              ; save incoming
parm
        mov     ax,040H                         ; BIOS data
segment
        push    ax
        pop     ds                              ; point DS to
BIOS data
```

```
        pop     ax                              ; get parm back
; Put ASCII code plus scan code in buffer
; check for buffer full
; wrap buffer if necessary
        mov     bx,ds:buffer_tail
        mov     si,bx
        inc     bx
        inc     bx
        cmp     bx,cs:buffer_end
        jne     cont
        mov     bx,cs:buffer_start              ; wrap pointer to
beginning
cont:
        cmp     bx,ds:buffer_head
        je      return                          ; buffer full so
do nothing
        mov     [si],ax
        mov     ds:buffer_tail,bx
return:
; reset number of ticks count
        mov     ax,0
        mov     cs:count,ax
;
; Click speaker
click:
        in      al,speaker
        and     al,0FEh                         ; clear bit 0 (no
timer ctrl)
        xor     al,02h                          ; toggle bit 1
        out     speaker,al
;
; Back we go
        ret

fill_buff       endp
; Initialisation starts here
inits:
        DATA_SEG                                ; data seg = code
seg
; Check to see if already ram resident
        mov     ax,3508h                        ; get vector of
tick int
        int     21h
        cmp     word ptr es:[bx-8],'WP'         ; address of
ident in es:bx
        jne     not_loaded
; If already resident then abort load
abort:
        PUT_MSG         msg1
        mov     ax,4c00h                        ; Terminate NOT
resident
        int     21h

msg1            db      'KPAD Vers 2.1 is already loaded.'
                db      'Reboot to remove. $'
msg2            db      'KPAD Vers 2.1  Loaded',0dh,0ah,
                db      '(c) P.Williamson --  1989.$'
```

```
; Display load message.
; Get and store current timer tick handler address 'cause we
; need this to chain to
not_loaded:
        PUT_MSG         msg2
        mov         ax,3508h                    ; get current
tick handler
        int         21h
        mov         cs:tick_offs,bx             ; store current
tick handler
        mov         cs:tick_seg,es
; Set timer tick vector to our handler
        DATA_SEG
        mov         dx,offset handler
        mov         ax,2508h
        int         21h
; Terminate and Stay Resident
        mov         ax,3103h
        mov         dx,50h                      ; arbitry No of
paras
        int         21h
mainprog            endp
code                ends
                    end         mainprog
```

Listing 1. *The detection of switch closure and the placing of scan codes into the keyboard buffer is taken care of by this terminate and stay resident (TSR) program which is hooked into interrupt 08 hex and activated every clock tick (approximately 50ms).*

Other experiments

WITH SOME modifications to the size and layout of the switches you can have a handy foot switch. The keypad can be used to produce sounds like a four key miniature piano (you don't need resident software for this – just use C, Pascal, or whatever, and poll the MSR in a loop) and if the standard PC speaker isn't loud enough you can use one of the serial port's outputs to produce sounds through your stereo amplifier (*Be careful!* as this trick requires some simple, interfacing electronics to avoid overloading the amp).

Since switches connected to the serial port don't necessarily have to be buttons functioning as a keypad putting characters into the keyboard buffer, there are a variety of interesting avenues that could be pursued.

How about using a reed switch and magnet to count revolutions of an exercise bike wheel and use this information to create a computer aided exercise package based on the number of revolutions in a given exercise time and so on? General purpose counters and timers can be constructed using a variety of switches as triggers. Interrupt or poll driven software can be designed to count closures and/or the time interval between them. A microsecond resolution timer, started and stopped by serial port switches, should be possible by reading the 8253 timer hardware directly, but switch bounce could be a problem without additional electronics.

If you come up with any interesting ideas (that work!), tell us about them so we can pass them on to other readers. □

CONVERT YOUR BASIC

The Define Function command in Basic can be used to translate commands between dialects – James Bowling tells how . . .

DID YOU EVER begin to key in an item of Basic software from a magazine or other hard copy source, only to find that your particular version of Basic did not support one or more of the commands needed? Most computer buffs have had this sad experience at some time or another, but hopefully, the technique developed here will help to overcome most of these hang-ups and allow you to get the most out of your computer.

The answer to the problem lies in that rather low-key function, DEF FN (Define Function) or its equivalent. DEF FN is intended to be used principally to define a mathematical calculation which is to be used repeatedly in a program. For example, if a program needed the repeated calculation of the trigonometrical sine of the sum of two angles, the formula –

```
SIN(A+B) = SIN(A) * COS(B) +  COS(A)*SIN(B)
```

– would have to be entered each time the calculation was needed. However, by declaring DEF FNSUM(A,B) equal to this formula, then it would suffice to use FNSUM(A,B) to give the required result.

This property of the DEF FN statement, of condensing a lengthy and involved formula into one simple expression, makes it a valuable tool to enable us to expand our Basic commands. For example, one of the functions missing from some versions of Basic is the MODULUS function, expressed in some versions as A MOD B, and in others as MOD(A,B). The MOD function simply gives the remainder when one number is divided by another (that is, MOD(50,7) = 1) and is very useful when dealing with increasing quantities which must not exceed a certain limit such as the 360 degrees of a circle or the 24 hours of a day.

The Modulus function is calculated simply by the expression –

```
MOD(A,B) = B * (A/B) -  INT(A/B)),
```

– so by declaring DEF FNMOD(A,B) equal to this expression, we may use FNMOD(A,B) to replace the missing MOD(A,B) and thus effectively expand our version of Basic.

DEF FN works equally well with alphabetic strings, and can be used to create FNUC$(A$) which will convert a lower case letter into its upper case equivalent. This is another function which is missing from some Basic versions. In the absence of such a function, we would need the following subroutine –

```
IF  ASC(A$) ) 96.5 AND  ASC(A$) ( 122.5 THEN
          A$ =  CHR$(ASC(A$) - 32)
```

– to use DEF FN in this situation, we must discover some way of introducing the conditional 'if' function. The secret lies in the SGN function, which gives the sign (positive, negative, or zero) of a variable. Thus –

```
SGN(X) = 1, SGN(-X) = -1, and SGN(0) = 0
```

So, the uppercase function may be defined as –

```
DEF FNUC$(A$) =
CHR$(ASC(A$)-16* ((SGN(122.5 - ASC(A$))) + SGN(ASC(A$) - 96.5))))
```

Assuming that A$ = 'a', with ASCII number 97, the FNUC$ formula becomes –

```
A$ = CHR$(97 - 16 * ((SGN(122.5 - 97))) + SGN(97 - 96.5))))
```

Now, both SGN(122.5 - 97) and SGN (97 - 96.5) are equal to 1, giving –

```
A$ = CHR$(97 - 16 * (1 + 1)),
```

Therefore, by using SGN in this way, we have said in effect, that if ASC(A$) is greater than 96 and less than 123, multiply 16 by 2, otherwise multiply 16 by 0, and then subtract the result from ASC(A$) and convert the answer into a character.

The use of DEF FN and SGN demands a certain amount of ingenuity to arrive at the result required, but the pay-off is worth it, and once the functions are created, they can be defined at the start of the program, along with the variable dimensions.

Below is given a list of what may be the most useful of these Basic 'pseudofunctions', together with one or two rather special ones (for instance, I know of no standard Basic function which will distinguish between numeric and alphabetic input, but the FNAN(A$) given below will do just that).

Also, the magic FNDMY$(Y$) is worth your attention . . .

Numerical functions

ABS produces the absolute value of a number –

```
DEF FNABS(X) = X * SGN(X)
```

ROUND rounds off a number so 5.1 becomes 5 and 5.5 becomes 6 –

```
DEF FNRND(X) = INT(X) + INT(X - INT(X) + 0.5)
```

FRAC gives the fractional part of a number so that 5.25 becomes 0.25 –

```
DEF FNFRAC(X) = X - INT(X)
```

MOD gives the modulus of two numbers –

```
DEF FNMOD(A,B) = B * (A/B - INT(A/B))
```

LOGA gives the logarithm of X to base A –

```
DEF FNLOGA(A,X) = LOG(X)/LOG(A)
```

String functions

UPPERCASE converts from lower case to upper case –

```
DEF FNUC$(A$) =
CHR$(ASC(A$)-16*((SGN(122.5-ASC(A$)))+SGN(ASC(A$)-96.5)))
```

LOWER CASE converts from upper case to lower case –

```
DEF FNLC$(A$) =
CHR$(ASC(A$) + 16 * (SGN(90.5 - ASC(A$)) + SGN(ASC(A$) -
64.5)))
```

CENTRALISE places a string in the centre of a page or screen –

```
DEF FNCNT$(A$) = SPACE$(40 - LEN(A$)/2) + A$
```

Then –

```
PRINT FNCNT$(A$)
```

Note: In this example, 40 is half the width of the screen or page. This figure would need to be adjusted for different page widths, and for different character widths. The formula to use is –

```
(PAGE WIDTH IN INCHES/CHARACTERS PER INCH)/2
```

RIGHT JUSTIFY locates a string at the right side of page or screen –

```
DEF FNRGHT$(A$) = SPACE$(80 - LEN(A$)) + A$
```

(Here again, 80 represents the number of characters per line.)
Then –

```
PRINT FNRGHT$(A$)
```

Often, in producing a formatted page of print (or screen display), it is required to place a string within a column of pre-determined width, left or right justified, or centrally placed. Using the normal Basic commands to effect the first of these, taking an example of the word 'cost' to be left-justified in a column twelve characters wide, we would have to use the following series of commands –

```
A$ = "COST"
WHILE LEN(A$) < 12
A$ = A$ + " "
WEND
LPRINT A$
```

The pseudofunction giving the same result would be –

```
DEF FNLJUST$ (W,X$) = X$ + SPACE$(W - LEN(X$))
```

– where W is the column width and X$ the string to be printed.
So, in our example, it would suffice to say –

```
LPRINT FNLJUST$ (12,"COST")
```

– to produce the required effect.
In a similar way, the centering of a string in a determined column of width W would be achieved using the pseudofunction –

```
DEF FNCENT$ (W, X$) = SPACE$(INT((W - LEN(X$))/2)) +
X$ + SPACE$(W - (LEN(X$) + INT((W - LEN(X$))/2)))
```

– and our string 'cost' would be printed in the centre of a 12 character column using the command –

```
LPRINT FNCENT$ (12,"COST")
```

To complete this sequence, a right justification of 'cost' in a column W characters wide would be achieved by the pseudofunction –

```
DEF FNRJUST$ (W, X$) = SPACE$(W - LEN(X$)) + X$
```

– and to add a new one, supposing you need to print a line such as the following –

```
"CHAPTER 3                                    PAGE 13"
```

on a page W characters wide, when the chapter number might be 15, and the page number anything up to several hundred. The pseudofunction for this would be –

```
DEF FNSPREAD$ (W, A$, B$) =
  A$ + SPACE$(W - LEN(A$) - LEN(B$)) + B$
```

– where W, as before, represents the page width, and A$ and B$ are the left and right strings respectively.

CURRENCY converts a number to a dollar format string –

```
DEF FNCURR$(A) ="$ "+
STR$(INT(A)) + MID$(RIGHT$(STR$(STR$(A - INT(A) +
1.000001),4,)1,3)
```

Following from this, the pseudofunction to print a currency string right justified in a column W characters wide would be –

```
DEF FNRJDOLL$ (W, X$) =
  SPACE$(W - LEN(FNCURR$(VAL(X$)))) + FNCURR$(VAL(X$))
```

Summarising the previous formatting pseudofunctions in an example –

```
LPRINT FNSPREAD$(55,"ACCOUNT","JANUARY 1990")
LPRINT FNCENT$(12,"DATE");FNCENT$(31,"NAME");
LPRINT FNCENT$(12,"COST");
LPRINT FNLJUST$(12,"21-01-90");FNLJUST$(30,"P.J. WILLIAMS");
LPRINT FNRJDOLL$(12,137.2)
```

Would produce the following –

```
ACCOUNT                                    JANUARY 1990

   DATE                NAME                    COST

 21-01-90     P.J. WILLIAMS                  $ 137.20
```

NUMERIC/ALPHA distinguishes between numeric and alphabetic input, use the following –

```
DEF FNAN(A$) =
SGN((SGN(47.5 - ASC(A$)) * SGN(ASC(A$) - 57.5)) + 1) + 1
```

Therefore, the usage might be –

```
10 INPUT A$
20 ON  FNAN(A$)  GOTO 100,200
....
....
100  REM PROCEEDS IF A$ BEGINS WITH A LETTER
....
....
200  REM PROCEEDS IF A$ BEGINS WITH A NUMBER
```

DMY(Y$) – to my knowledge, this function does not exist in any version of Basic. It is a gigantic DEF FN, demanding five auxiliary pseudofunctions before arriving at the final solution, which is will convert the string '01-01-1988', or a similar day-month-year date into 'FRI JAN 1, 1988', or the equivalent. So, if DATE$ = '15-07-1989', then after defining this function, the program line –

```
PRINT FNDMY$(DATE$)
```

would print –

```
SAT JUL 15, 1989
```

There is a trap here, in that the date format must be in the form DD/MM/YYYY, that is, day first, then month, then the year, including the century (we are getting so close to the next century that we must take this into account). Here is FNDMY$(Y) –

```
DY$ = "364031059090120151181212243273304334"
DW$ = "MONTUEWEDTHUFRISATSUN"
MY$ = "JANFEBMARAPRMAYJUNJULAUGSEPOCTNOVDEC"
DEF FND1(Y$)=
(INT(((VAL(RIGHT$(Y$,4)) - 1) - 1980)/4) + 1) * 366 +
     VAL(RIGHT$(Y$,4))
-1980 -(INT(((VAL(RIGHT$(Y$,4))-1)-1980)/4) + 1)) * 365
DEF FND2 (Y$) =
     VAL(MID$(DY$, (VAL(MID$(Y$, 4,2)) - 1) * 3 + 1, 3)) +
     SGN((SGN(INT(VAL(MID$(Y$, 4, 2))/3)) * SGN(1 -
     SGN(VAL(RIGHT$(Y$, 4)) MOD 4)))) + VAL(LEFT$(Y$, 2))
DEF FNDY$(Y$)=
VAL(MID$(DW$,((FND1(Y$) + FND2(Y$)) MOD 7) * 3 + 1, 3) + " "
DEF FNM$(Y$)=
MID$(MY$,(VAL(MID$(Y$, 4, 2)) - 1) * 3 + 1, 3) + " "
DEF FNSS (X, A, B) =
2 + SGN(SGN(X - A) - SGN(B - X))
DEF FNDMY$ (Y$) =
FNDY$(Y$) + FNM$(Y$) + " " + MID$(STR$(VAL(LEFT$(Y$,2))),2)
+ ", " + RIGHT$(Y$, 4)
```

As we have seen, the DEF FN operator can be of tremendous value in substituting for non-existent Basic commands, and it is well worth applying, even if it is only to eliminate the annoying lines –

```
IF Y$ = "Y" OR Y$ = "y" THEN GOTO 100
IF Y$ = "N" OR Y$ = "n" THEN GOTO 200,
```

and replace them with –

```
ON INSTR("YN",FNUC$(Y$)) GOTO 100,200.
```

To say the least, DEF FN is a powerful tool that allows you to make those interesting programs work, even if they use a different Basic dialect from yours. □

SAVE THIS MUCH

BUT SAVING MONEY ISN'T THE ONLY REASON TO SUBSCRIBE!

The greatest proportion of our readers buy the magazine at their local newsagent every month (for that we're thankful), you're the ones who largely pay our way). But, taking out a subscription has advantages for both of us in that it can help provide you with a better magazine. And, as our staff greenie pointed out, it can save some trees.

My experience at YC has shown that our reader's tend to be an exceptionally aware crew. Not only do you want to know more about computers and gaining greater productivity from them, but, you want to find a magazine that stimulates your interest in computers — and their applications — with timely and informative articles. If the magazine is at a good price, all the better!

As I said, you all tend to be an aware crew but, the high-tech dynamics of the computer industry's competitiveness and the associated hype means you're probably more suspicious than most when asked to fork out your money in advance for anything. Who can blame you? Recently I ordered and paid for a certain article of software I thought would make my computing life a bit easier; only to be told that the advertised version of the product was no longer being shipped since a new release was on the way 'real soon now.'

But — there are some very real reasons to subscribe. For a start, right now we're offering a special discount for subscribers. Instead of paying $54 for 12 issues at the newsagent, you can have those same magazines for $37.80 (that's $3.15 an issue, delivered to your letter box before it's on sale at the newsagents). And that can help us bring you a better magazine. Let me explain that: For every reader who subscribes instead of buying the magazine off the newstand, we need to print one copy less. That's because there's a lot of wastage in Austalia's magazine distribution system — not so much inefficiency, as the simple fact that there are over 6,000 newsagents scattered across 3 million square miles of countryside — so, we have to print and distribute almost 2 copies for every 1 that's eventually sold. And, that's about the best that can be expected from a 'special interest' magazine like ours that only appeals to a relatively small percentage of the general readership. But, for every subscriber, we only have to print 1 copy. That means we use less paper — so subscribe and save a tree!

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Jake Kennedy.

LAPTOP CLINIC

Part 2 DISPLAY SCREENS

Want to know how the various laptops work and what they're like under different lighting conditions? Tom Moffat explains . . .

WE SHOULD consider ourselves truly lucky to have laptop computers. Portables, as distinct from laptops, have been around for quite a few years. Looking back on them, they were pretty primitive machines compared with what's about nowadays. They ran CP/M (nothing wrong with that!) and used small CRT picture tubes for display.

The original Osborne 1, which was probably the first portable computer, had a tiny screen about 100mm across. An 80 *x* 25 character display would have been impossible to read, so the computer only showed a section of it at a time. You used the cursor keys to slide the CRT 'window' over the part of the text you wanted to read. That was pretty heavy going, but still that little Osborne was far advanced on anything else around at the time.

Another 'portable' computer that CP/M people lusted over was the Kaypro. This machine packed into a rugged metal case the complete computer guts, a couple of disk drives, and a monitor that I remember was about nine inches diagonally. The Kaypro was a truly lovely machine, although beyond the finances of the average hacker. We only dreamed of them.

Osborne got their act together to counter the Kaypros, and came out with a similar machine called the Osborne Executive. These machines still come on the used market occasionally and bring high prices. And of course Apple got in on the act, with a small-screened computer that could be carried around in a case. They called it a Macintosh.

All these 'portable' computers were based on a CRT display, the same kind of technology used in traditional computer monitors and TV sets. But the development of truly 'fold-uppable' portables depended on finding a substitute for the Cathode Ray Tube, and all the glassware that sticks out behind its screen. At that time calculators and watches were using a small, flat display called a Liquid Crystal Display or LCD. The obvious step would be to develop the LCD as a replacement for the traditional picture tube.

LCD works

BEFORE GETTING INTO the theory of liquid crystals we should first look at the concept of polarised light. Light waves jiggle up and down, side to side, and around. If we pass light through a fine grid of horizontal slits, like a miniature Holland blind, only the light waves moving side to side will get through, and the rest will be blocked. The light that gets through is said to be horizontally polarised.

If the same light waves then strike a grid of slits that have been placed vertically, the horizontally polarised light will be stopped altogether. Rotating the second polariser to the horizontal position will let the light through again. So you can stop the light, or let it pass, by twisting the second polariser.

A liquid crystal is a funny chemical that has the ability to rotate or 'twist' the polarity of light passing through it. How much it twists the light can be controlled by impressing a voltage across the liquid

crystal. Now, if you take a polarising grid as mentioned above, and a second one, and place them so that they are rotated 90 degrees apart from each other, no light will pass through, right? But if you then stick some of this liquid crystal material between the two grids, and place a voltage across it, the light passing through will be rotated so that it's no longer 90 degrees out of whack when it hits the second polariser grid.

If the liquid crystal rotates the light exactly 90 degrees, the light's polarisation will be back where it started from by the time it hits the second grid. So the light will pass right through, unhindered. Get the idea now? Volts off – no light through the grids, volts on – light goes through OK.

If you now make up a matrix of thousands of these little polariser/crystal cells 200 high and 640 across, and then arrange to have separate electrical signals sent to each cell, you can cause any or all of them to either let light through, or block it. Now we have a liquid crystal display. You can put a light behind it for a backlit LCD, or use a mirror instead for a reflective LCD.

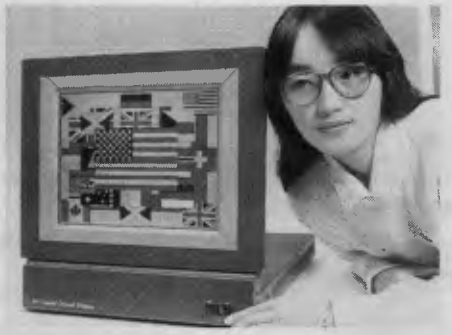
The earliest liquid crystal materials required a layer about 3mm thick to produce a 90 degree light rotation. Individual cells made of this goo would probably be several millimeters across. But a new chemical form of liquid crystal was developed that would spin light around through several full circles if it traveled through 3mm of the stuff. So the amount required to give a 90 degree twist would only be a few molecules thick. The new liquid crystal material, known as 'super-twist', meant each cell of it could be of pinpoint size. So a 640 *x* 200 cell matrix could be made as small as the lid of your laptop!

How LCD screens measure up

WHILE RESEARCHING this article, I was able to extensively use both a backlit and a reflective screen version of the Toshiba T1200 laptop (the 'B' in Toshiba model numbers, such as T1200FB, signifies a backlit screen). The technology behind these screens, and their characteristics, would probably be pretty much the same on any brand of laptop using a 'supertwist LCD' type display.

The ideal laptop display screen would look great under any lighting conditions. It would draw little power and would be dirt cheap. Trouble is nobody's invented this type of screen yet. So, among laptops with LCD screens, we have to make a choice between a backlit or reflective screen, and once that choice is made, we're pretty much stuck with it.

It's interesting to note that computer sales staff seem to be firmly polarised toward either backlit or reflective LCD screens. Some told me, 'You must have backlit, you'll never be happy with anything else'. But others claimed that reflective screens were the only practical answer because of the high power consumption and extra cost of backlit screens.



***14-inch Color Liquid Crystal Display** – A high resolution color LCD with 720 x 550 pixels capable of displaying high quality pictures with up to 16 colors has been developed by Toshiba, Japan.*

Both types of screen have their good and bad points. Unfortunately, neither of the screen types is perfect for every application. It would be ideal to have interchangeable screens, so you could select backlit or reflective, depending on where you would be using the computer. With the Toshiba T1200 model laptop, you can upgrade a reflective screen to a backlit one. But the modification involves major and delicate surgery within the computer, and should only be performed by dealer service departments. But with Toshiba's up-market T1600 laptop it appears that you can do the big swap yourself.

Moving to a backlit screen isn't necessarily an 'upgrade', because there are many instances where a reflective screen will outshine a backlit one.

Reflective LCD

THE VERY FIRST flat-panel display screens were reflective LCDs, and they were pretty horrible. You had to have the light coming from just the right way, and held your head in just the right position. Then you could read the characters on the screen. Well, some of them, anyhow. Nowadays most of these problems have been overcome. The viewing angle isn't so critical, you only have to be in front of the computer to read the screen OK. The light can be coming from just about anywhere (but there must be plenty of it).

The LCD screen will have a 'contrast' control which must be fiddled with to optimise the contrast of the characters against the background. Too far one way and the screen will go all dark blue, as if all pixels were on. Too far the other way and it goes completely light yellow, all pixels off. Right now I'm sitting in bright sunlight, facing the sun, so it's not shining directly on the screen. With the contrast control properly tweaked I have good sharp blue characters, and the background is greenie-bluey-yellowy. An odd color, but a nice overall effect.

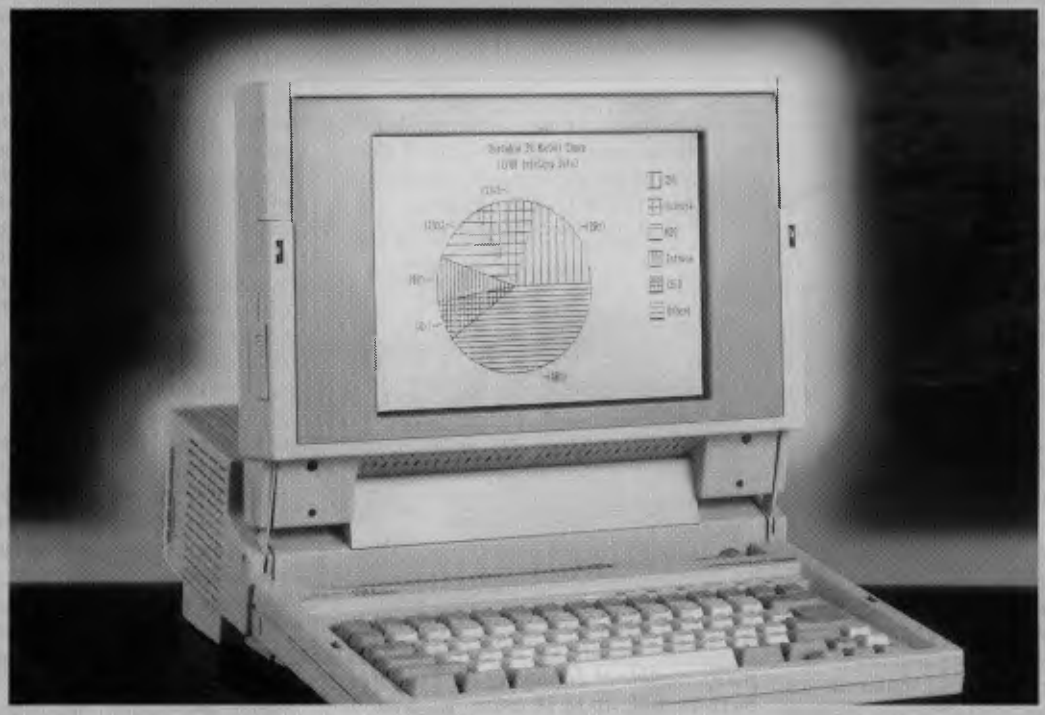
The screen appears to be very sensitive to temperature. When I first turn the laptop on in the morning and the temperature is near zero, the screen is very dark and needs a good twist of the contrast control to make it readable. A few minutes later, and then later again, I have to re-adjust the contrast back towards darker as the screen warms up and lightens. After a half-hour's use or so the screen settles down, and seldom needs re-adjustment. I believe this effect is quite normal for LCD displays.

Indoors, the reflective LCD screen works fine where there's lots of light, such as in an office with big windows and overhead fluorescent lighting. At home my indoor 'workstation' is a dining room table situated next to a large window. During the day the reflective LCD works well (but not as well as a backlit). However at night, the table is lit from above by two inefficient recessed spotlights. I try to boost the light a bit with a desk lamp, but the result is still not too brilliant.

Despite the occasionally dubious image quality of the reflective LCD, it has one unbeatable advantage: its power consumption is minuscule, and this is of paramount importance in a battery-powered computer. The reflective LCD version of the Toshiba T1200, using only the ram disk (no physical drives), will run for seven and a half hours on one battery charge. This is more than two and a half times longer than the backlit version.

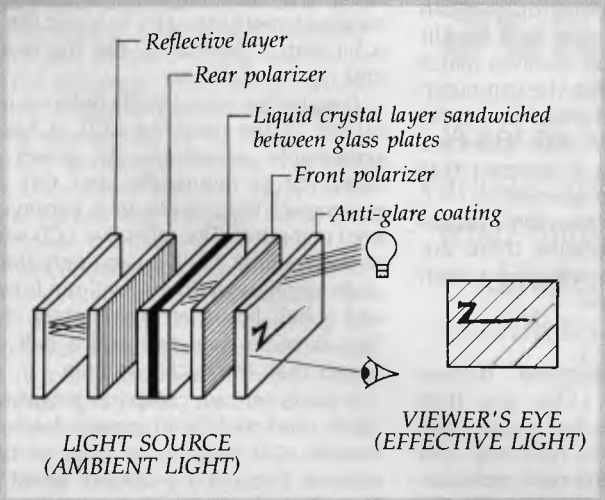
A world renown computer magazine recently predicted the imminent death of reflective LCD screens, in favor of backlit screens. I've got my doubts about that. For what it's worth the same magazine predicted the rapid passing of MS-Dos, and look where that got them.

A whiter display

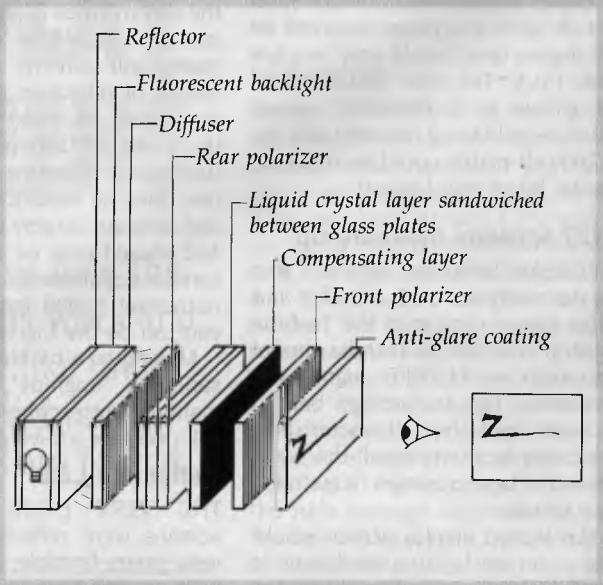


IN MID-1988 Zenith released their TurboSport 386, the first portable to use a 'paper white' display (Epson followed very closely, several months later). Zenith term their system Page White and it is similar to the backlit super-twisted displays discussed in the main article – with significant improvements.

A 'passive' (*not* backlight) ambient light is used as the source in many portables. This means that the light needs to pass through the attenuating layers twice, which reduces brightness and contrast (the polarized layers are discussed in the main article) –



The Page White display system uses a high intensity fluorescent lamp as a light source – while this necessitates the addition of a reflective layer, a diffuser to even out the light, and a layer for color correction (otherwise, the colors would all be very low contrast blues). The compensating (correcting) layer gives the black-on-white look to the display –

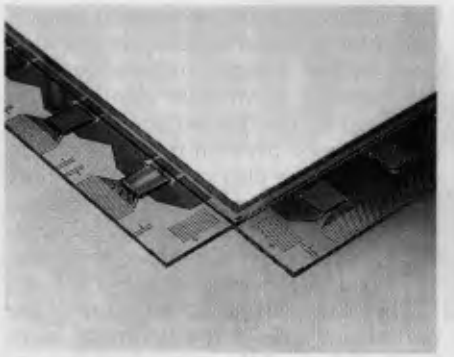


The design gives contrast ratios up to 30:1, which is two to three times greater than those obtained with conventional super-twist displays.

The backlit LCD

UNDER THE RIGHT conditions (in other words indoors) the backlit LCD screen will give the very best possible image quality. It rivals the quality of a good CRT display.

The light in a backlit screen comes from an 'electroluminescent' material, a chemical that emits light directly when a high voltage is impressed across it. There is a panel of the stuff behind the screen, where the reflecting material in a reflective display would be. The light it produces is a soft blue-white, much like the color of mist on a foggy day. The screen has a brightness control so you can vary the intensity of the backlight. This is in addition to the contrast control mentioned above. Outdoors the backlight is non-existent for all practical purposes. It's still there, but it's totally swamped by light from the sky. The electroluminescent material doesn't reflect very much; it's more of a muddy brown color under direct light from outside. So outdoors, a backlit screen produces the usual blue characters against a murky brown background. You can read it, but it's not near as nice as a reflective screen.



COG (Chip On Glass) technique – this is a new IC assembly technique using a low melting point metal to connect driver ICs directly onto the glass substrate of a liquid crystal display panel.

As mentioned earlier, a backlit screen draws a lot of power compared with a reflective screen. This is because of the high voltage needed to make the backlight light up. The voltage required would be on the order of a couple of hundred volts, but since the computer runs on a battery of around 7.2 volts, a power converter is built into the computer to boost the voltage. The converter works by changing the battery's DC current to AC with an oscillator, and then stepping it up with a transformer. In the Toshiba T1200 you can hear the oscillator running – it produces a high whine. It's not very loud and would probably be masked by the background sounds in an office environment.

The CRT screen

IN THIS DISCUSSION we shouldn't forget the CRT, or cathode ray tube, the traditional computer monitor. Virtually all laptops on the market would have some means of connecting a CRT in place of the inbuilt screen. This is simply an acknowledgment of the fact that no laptop screen, no matter how good and expensive, is up to the quality of a good CRT.

Many laptops can drive both a 'composite' monitor and a more up-market RGB monitor. And of course the output

contains full color information. The quality is very good, at least in the case of the Toshiba. I've tried it with four different monitors. An average-quality RGB monitor running under CGA standard performs pretty much as would be expected. An 'Intra' dual-standard amber monitor, the one normally connected to my full-sized PC, does its usual performance of converting CGA color information into nice even shades of gray.

A world renown computer magazine recently predicted the imminent death of reflective LCD screens, in favor of backlit screens.

But what's surprising is how well the composite output works, at least with a monochrome monitor. I've used both an Ingersoll and a Microbee amber monitor with the composite output, and they are just as good as the CGA. The Microbee monitor in particular seems to work better with the laptop than the Microbee it came with.

One place where a CRT monitor would be essential is where numerous shades of gray are required. Normal text applications are no problem as an LCD can generate normal, bold, and inverse characters. But with graphics there aren't many choices of gray levels, basically white (all pixels off), gray (half the pixels on), and black (all pixels on). When doing something like CAD work on a monochrome screen (my preference over color) you'll need at least four and maybe more levels. The CRT takes care of this nicely.

Gas plasma displays

THE GAS PLASMA display is probably the closest attempt yet to emulate CRT performance in a laptop's flat lid. The height to width ratio is generally the same as a CRT, not 'squashed' like an LCD display. And the very latest gas plasma displays can produce up to sixteen shades of gray. They are usually found only on the more expensive laptops.

Gas plasma displays work by applying a high voltage to a gas, either neon or neon with a bit of argon added. The gas then glows with an orange or red-orange color. The principle is virtually identical with that used by the familiar neon sign. The gas is trapped between two glass sheets which forms the display panel. One sheet has a grid of conductive, but transparent, electrodes running horizontally along it, like invisible wires. The other sheet has has a grid of vertical electrodes.

When electricity is applied to one of the vertical and one of the horizontal electrodes, the gas at the point where they intersect will glow. This forms one pixel. It is possible to make these pixels quite small, so gas plasma displays commonly have resolutions of 640 x 400 pixels, twice as fine as an LCD display.

There are some disadvantages with gas plasma displays, such as no backlighting, but the gas itself emits light and therefore requires energy. Thus a plasma display draws even more power than a backlit LCD display. Another worry is that some reports state that gas plasma displays have a somewhat limited life. And they are very expensive to manufacture, so you wouldn't want to replace one too often.

There's nothing new about gas plasma technology. The very first digital displays on calculators and electronic instruments used neon tubes called 'Nixie tubes' which could generate fixed shapes of numbers between 0 and 9. These didn't seem to last very long and it was quite common to see a Nixie display with a dud digit. Nixies were also quite useless in bright sunlight as their soft orange glow was simply swamped. I have never seen a laptop with a gas plasma display operating outdoors, but I'd certainly want to try it first before purchasing one.

Choosing displays

I THINK IT boils down to this: is your laptop going to be an indoor or outdoor computer? If the laptop will be used at your office and at home, your best choice would certainly be a backlit display.

On the other hand, the laptop may be used by a scientific field party, or for something like surveying or mineral exploration. Or you might simply prefer to take your office work out into the fresh air. Then you'll need an outdoor computer, and you should be looking at a reflective LCD display.

A third situation might arise where you find the reflective display is most useful, yet you still must work indoors when it's cold or raining or dark. In this case you can go for a reflective laptop, but supplement it with a CRT monitor. Based on retail prices, there's just about enough difference between a reflective and backlit laptop to pay for a reasonable color monitor. Or a really nice monochrome one.

Going a bit further with the subject of indoor laptops, it's obvious that the extra power consumption of a backlit screen is of little consequence, since there's always a power point lurking nearby. You can run the computer with the battery charger connected all the time. Once the battery is fully charged the computer simply kicks it out of the circuit and the battery lies there, dormant.

The Chendai company has picked up on this theme and developed an indoor laptop with no battery supply at all. This nicely solves the problem of converting the 7.2 volt battery voltage to all the other voltages needed for the computer itself, a backlit screen, and the disk drives. These voltages are much easier to produce when you have a mains voltage to start with. And without all the flashy power supply technology, the computer is much cheaper to build.

The ideal laptop display screen would look great under any lighting conditions.

Consequently, even the base-model Chendai has heaps of features such as full-sized IBM style 5¼ inch drives, a backlit screen, and even an internal modem as standard. Yet it costs substantially less than even the cheapest battery-powered laptop. If you're after an indoor laptop, the Chendai would certainly be worth a look.

Coming up next

BY NOW YOU should have a fair idea of how the various laptop screens work, and what to expect from each one under different lighting conditions. In the next installment of Laptop Clinic we will examine how the IBM character attributes apply to LCD screens. This will lead to ways of getting the best possible performance from your software by installing or initialising it specially for an LCD display. □

THE LEGACY OF MR REED AND MR SOLOMON

Whether it's a satellite broadcast from Jupiter or CD-audio, the errors are corrected the same – Stewart Fist reports . . .

VOYAGER II, the long-distance space probe that swung around the far side of Neptune recently and headed out into the unknown, is a bit over twelve years old. On-board, the entire control system, digital image, data recording, playback and transmission systems, were all run by five 8-bit computers equipped with a total of 32K of memory.

There are two identical Computer Command Sub-systems (CCS) that are the brains of the spacecraft, an Attitude and Articulation Control Sub-system (AACS) that looks after the thrusters, and the twin Flight Data Sub-systems (FDS) that, with 8K of memory each, control the scientific and imaging side of the craft, and the telemetry data sent back to Earth.

Considering the amount of functionality the programmers at Jet Propulsion Laboratory (JPL) managed to cram into this tiny RAM space, I am tempted to say they 'don't make 'em like that any more' – but they do. The on-board Voyager II CCS computers were re-programmed by radio – it took them two days and five hours.

When JPL and NASA shot Voyager II into space back in 1977, it hadn't been envisaged that it would ever fly so far – a quick swing around Mars then on to Jupiter, was felt to be pretty ambitious. But Voyager II did better than anyone could have expected in their wildest dreams. After a bit of judicial re-programming, it was sling-shot around the first two planets and gained enough acceleration to climb the long uphill distance against the gravitational grade of the solar system – through the rings of Uranus (which destroyed some of the electronics and created problems of camera control) and on past Neptune and Triton.

Each day that Voyager II flew away from Earth, the problems of data capture and control increased. For each of the four successive fly-pasts they have had to re-program the on-board control computers by radio at 16-bits per second. And each time they had to change the FDS computers to reduce the data and image transmission speeds, so as to have some chance of distinguishing bits and bytes emanating from a 100 watt radio source billions of kilometers away, against the background noise of the universe.

At Mars, they were able to transmit science and image information back to Earth at 21.6 kilobits per second (kbps), but by the time they reached Neptune they had to cut back data speed to 4.8kbps. This gave them real problems since their 12-year-old digital recorder couldn't handle the number of images and scientific data they had to store (each image takes 5.12 megabits) as they passed behind Neptune, and the low data-rate meant that they couldn't clear-out the recorder by transmitting it at a high-enough speed before they came in on Triton.

Reed Solomon codes

SO, DURING the approach to Neptune, they re-programmed those 8K of FDS RAM with image compression software to reduce the transmission load. At the same time they added Reed Solomon error correction codes that hadn't been invented when Voyager left earth. The old type of Golay error correction code doubled the amount of data that needed to be transmitted, but Reed Solomon only added an overhead of 30 per cent – and it worked much better.

These are the same Reed Solomon codes that validated the data returning from the Giotto space craft that flew through the tail of Halley's comet, and allow your CD to play digital music without a glitch, even with deep scratches and dirty finger marks on the disk surface. Reed Solomon, in fact, is becoming central to our handling of high-speed data of all kinds, and it is one of the most important developments in computer software of the last few decades.

With CD-ROM, the problems of error detection and correction (which are two entirely different processes) are much more acute than CD-audio, so here Philips and Sony have added extra layers of error correction. What type of error correction? Reed Solomon, of course!

The danger in CD-ROM is with scratches and defects on the disk surface which can result in numerous adjacent bits being lost – so they had to design a system which can correct 'bursts' of up to 1000 missing (or incorrect) bits. Within these limits, CD-ROM can regenerate the original data – it will only fail with one bit in every ten quadrillion. Notice that I said 'regenerate' – this is not just a detection system. As Maxwell Smart says, 'would you believe' that the detection of errors is even better? CD-ROM systems can detect error rates of up to 1 bit in 1025 – which is 1 wrong bit in 2 quadrillion CD-ROM disks – and that's a stack about a billion miles high.

You may have stumbled across a CD error correction and detection system under the acronym CIRC. This stands for Cross Interleaved Reed Solomon Codes, which is the first level implemented on both CD-audio and CD-ROM. CIRC correction keeps the primary error level down to a guaranteed 1 bit in 109.

When a CD-audio disk has a 'burst' error of a fraction of a second, it is a relatively simple task to detect that bits are missing and if they can't be corrected, the

continued on page 106

ANALYTIC MUSCLE WITH LOW-COST SPREADSHEETS

If you need analytical muscle in a spreadsheet, there are packages that offer more than the market leaders – at a fraction of the price!

LOTUS 123 HAS the spreadsheet market sown up, and with Releases 3 and 2.2, it has guaranteed a continuing reign on '386 and '286 machines. But that doesn't mean it is the only spreadsheet around, nor the only tool for the job. PC Express, for example, beats Lotus hands down for analysis, but you have to have megapennies to afford its $3600 minimum price tag.

Here we profile a number of packages which are much cheaper, but provide analytic muscle at least equal to that of Lotus Version 2.

PFS:Plan is an elegant and powerful 2-D spreadsheet, with excellent graphs, for a mere $160. Lucid 3-D is similarly priced, and offers a 3-D model which for consolidation purposes is superior to Lotus 3. Javelin Plus is a useful tool for time based analysis, while TK Solver is an equation processor which is far superior to a spreadsheet if you want to do goal seeking.

PFS:Plan

PFS:PLAN IS a most peculiar spreadsheet. Most spreadsheets store their data and equations together, while Plan separates them. Most spreadsheets treat your file as an enormous page; Plan lets you take selected columns and rows – no matter how widely separated they are – and see them on the one screen. Most spreadsheets make consolidating your data very difficult; Plan, within limits, does it easily. Until Borland's Quattro, the graphics in spreadsheets were normally appalling; Plan's graphs are a subset of those offered in its sibling Harvard Graphics, still the leading business charting program.

So why isn't it more popular? As usual, the reasons have more to do with marketing than with merit. Plan arrived on the scene after Lotus had cornered the market. It is highly unlikely that Plan will ever challenge Lotus at the top of the spread-

LEE WOOLERY/THE IMAGE BANK

sheet pyramid. But it continues to offer a solid product, which may be of special appeal to people who produce a lot of presentation quality graphics, or to accountants who would like their spreadsheet to function like their cash books do.

Cosmetically, Plan is much like its stablemates Harvard Graphics and Professional Write, and quite unlike the average spreadsheet. Borders delimit the columns; there are row and column titles regions, clearly delimited from the spreadsheet itself; and columns are numbered C1, C2 and so on, like Multiplan.

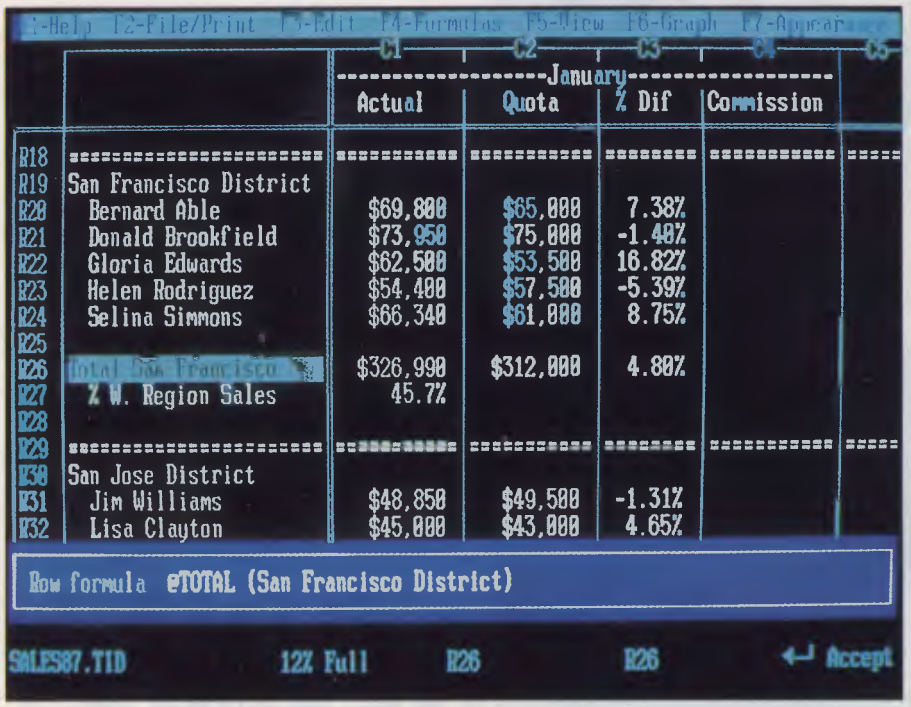
The main menu is displayed on top of the screen, and it's function key driven. Once you've pressed a function key, a drop down menu appears listing other options which are chosen by pointing, or pressing the first letter. Function key commands are supplemented by control key combinations for rapid use, so that Ctrl-F, for example, starts formula entry. Plan's treatment of row and column labels and formulas is different from, and superior to, the standard spreadsheet method. As you type a column label, the column will expand to suit; ditto for the row column as you type in lengthy labels. Column and row labels can be multi-line, so that if you put the header 'Q1' over the labels 'Jan Feb Mar', Q1 is automatically the sum of any numbers entered into Jan, Feb and Mar.

Formulas

FORMULAS ARE also treated unusually. You can enter cell formulas if you wish, just like normal spreadsheets. But you can also enter formulas on a row (or a column), in which case they affect every numeric entry on that row. Formulas can use row and column co-ordinates, but they are much better designed if you use the row and column titles instead. So the formula @TOTAL (Sales, Expenses), entered as a row formula beneath an indented list of expenditures, would add up all the indented numbers across all the months of the spreadsheet.

Formulas can also use row and column labels rather than cell references, which makes for a far more easily audited spreadsheet than those based only on coordinates. The use of grouping labels assists further: indent Bondi, Waverley, and so on, beneath the heading Eastern Suburbs, and the formula @Total(Eastern Suburbs) automatically adds up all the suburb figures.

Most spreadsheets only let you see a set number of contiguous rows and col-



With PFS:Plan's 'Quick Entry' system (Ctrl-Q) enters dates, numbers, or letter/number combinations automatically, using your abbreviations. For example, start with January, and the program will next enter February; enter FY89, and it will provide FY90.

umns at the one time. With Plan, you can set up a number of Views which amalgamate non-contiguous rows and columns from anywhere in the sheet. Views can amalgamate budget data out of a sheet showing actual and budget figures, for example.

Plan graphics are a subset of those possible from Harvard Graphics. You get all the basic graph types, but no ability to provide 3-D or other enhancements. You nominate which rows or columns to treat as series by putting the letters A to H in the required columns or rows; if you're not graphing the entire row, plus or minus entries in the required columns select or exclude specified columns.

Once you've cited the data, a form appears where you can type the graph legends and specify certain stylistic features such as type of graph, grid lines and labels.

The graphs are certainly presentation quality – superior to those possible with Lotus Release 3, or Supercalc 5. You can store up to 18 graphs with a spreadsheet, and they can be exported for further enhancement with Harvard Graphics if desired.

Macros

PLAN IS FULLY macro programmable, with macros being auto-recorded once they are invoked. A macro can pause for user input, call other macros, execute conditional statements, display messages to users, and even have a customisable menu.

The macro commands recorded can be edited by a built-in macro editor, and they appear like a proper programming language rather than the jumble of keystrokes that a standard spreadsheet has.

Product Details

Product: PFS:Plan
Distributor: Micro Australia
4 Sirius Rd,
Lane Cove 2066 NSW
(02) 418 6242
Price: $161

It offers superior graphics very cheaply, high quality macros, plus the ability to easily view and print non-contiguous regions of a sheet.

Macros are stored in separate files, and can be linked to any spreadsheet file for execution. Thus the one macro can operate on numerous files.

VisiCalc, the original spreadsheet, was supposed to be a simile for the accountant's book system. Plan is in fact a much better simile: it has borders for titles, most formulas are entered in the borders, and headings are indented to group them together into categories.

It offers superior graphics very cheaply, high quality macros, plus the ability to easily view and print non-contiguous regions of a sheet. Anyone who cut their teeth on First Choice, from the same publishers, could do well to graduate to Plan; it is certainly an easier step than moving to the less aesthetic 123.

It has only recently been superceded in power by the new breed of 3-D sheets (Lotus and Lucid in particular), but it still has a lot to offer within the 2-D model. Its use of grouping of labels makes it more suitable than most of its 2-D competitors for consolidation.

Plan would lose a head to head confrontation with Lotus or Lucid in power terms; however, if your primary need was for graphics, then its superb quality graphs and direct link to Harvard Graphics make it an excellent choice.

TK Solver Plus

SOFTWARE ARTS, the original authors of TK Solver, also designed VisiCalc, the first spreadsheet. Little wonder then, that what a spreadsheet does poorly, TK Solver does well while still managing to do most things that a spreadsheet can do.

A spreadsheet is very uni-directional. If you have designed a model to work out what repayments you will face for your house mortgage at different interest rates for a 25 year term, it's difficult to twist that model to find out what term you would face if you increased your payments by 10 per cent. If they can handle it, spreadsheets call that sort of calculation 'goal seeking', and it is normally both complicated and rather limited.

Getting the same result out of TK Solver is no problem. Simply blank out your data for term, type in a 10 per cent higher repayment, and *voila* – you find that your term will drop to 18 years.

Spreadsheets are also very difficult to audit. Unless you're using Framework, Excel or PFS:Plan, where equations can be

entered in English, your formulas get lost in a maze of obscure cell references; only PFS:Plan lets you separate equations from the actual data. TK Solver clearly separates data – stored in a variable sheet or in lists – from formulas, which are entered in full English (or whichever language you prefer). Inputs are obviously inputs, and results are clearly the results of equally clear equations.

For most simple tasks, I'd still reach for a spreadsheet first. But where I had a complicated model to build (anything with non-linear features, or simultaneous equations, or where there are several things I might want to calculate rather than just one), TK would probably get the nod.

The essence of TK Solver is in solving simultaneous equations. If you think you never do that, and you use a spreadsheet, then think again: entering the number 30 into cell A1, 20 into A2, and the formula A1-A2 into A3, is a simple form of simultaneous equation. The difference with TK Solver is that the equations are entered separately from the data. The program loads with the screen split into two windows, called sheets. The top one is the Variable sheet, which contains your data, the bottom the formulas sheet. The cursor is initially in the formula sheet. If you type a formula there using the manual's example) of 'Price - Deposit = Loan', then immediately the three variables Price, Deposit and Loan appear in the variable sheet. If you transfer to the variable sheet, enter numbers and press F9, the equation will be solved. It doesn't matter which two variables you enter the numbers for – so long as you enter two, TK will solve for the third.

Models

THE STARTING POINT for any TK Solver application is an equation: simply type it into the Rule sheet, like the example equation above. As it stands, this model can solve for only a single deposit, price, term and interest rate. To make it more useful, you might want to enter a list of possible interest rates. You can do that simply by 'diving' into the detailed sheet for the rate variable and associating rate with a list, called rates (for example).

Next you would dive into the list and enter the rates. Pressing F10 (the List Solve key) will then generate a list of payments, one for each rate of interest. To produce a spreadsheet-like table of interest rates and payments, you'd move to the Table sheet, and define a table which contained those two variables. A quick switch to the Plot sheet to define a graph with both variables, and you'd have a graph of the relationship between interest rates and monthly payments.

All that you could do, almost as quickly, by designing a spreadsheet, creating a payment formula, and replicating it over a range with a different interest rate on each line. But what you couldn't do is suddenly modify the model to see what your term would be with a set interest rate and different payments. With TK Solver, that's a breeze. Simply cease associating rate with a list (one tap of the spacebar does that), make payment and term lists, and enter a range of payments. Press F10 and you'll get a list of values for Term; define a table and a plot, and you'll have the numbers and a graph linking your repayments to the term of your loan.

TK Solver can also solve problems which involve iterations (successive approximations to approach a correct answer), which makes it useful in solving non-linear problems, as well as linear ones (solving for interest rate, given loan and term, would require iterative solving). All you have to do is supply a first guess.

Flexible problem solving

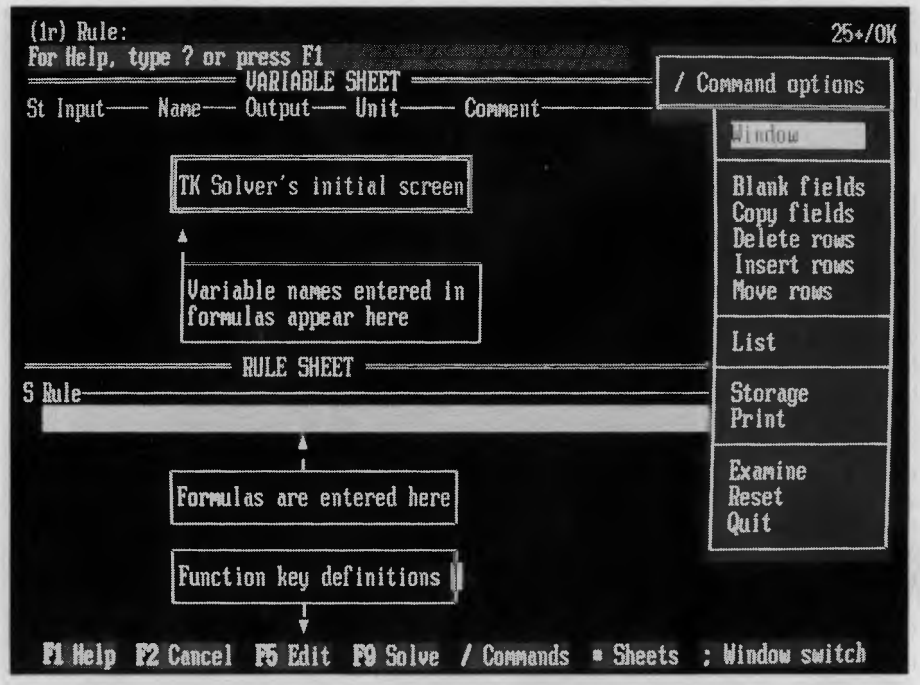
CLEARLY THE MAIN advantage of TK Solver over the spreadsheet is its flexibility in approaching a problem, with its facility at backward and forward solving the most obvious manifestation of that. It is also a whiz at simultaneous equations. Normally to arrive at an answer to these, you have to solve the equations to generate what is known as a 'reduced form', and then feed your data into that for an answer. TK Solver works better with the original equations themselves; no algebraic solving is necessary.

TK's ability with non-linear equations have made it a favourite of electrical engineers and the like, for modeling the likes of circuit behaviour and oscillations – things they first tried to model with spreadsheets but found unbearably complicated.

Most spreadsheets have a macro language; what TK Solver provides almost qualifies as a full programming language. For a start, it uses English language commands and variable names, which makes it far easier to write in and debug than a macro. It has the ability to create subroutines and user defined functions, there is conditional logic with IF ... THEN ... ELSE constructs, and a form of looping using a GOTO command and labeled subroutines, as well as a FOR NEXT statement.

TK Solver comes with a large Library of models – everything from statistical analysis through differential equations and electronic circuit design to diagnosing the health of a car. These models take advantage of both TK's equations and its programming language.

The spreadsheet is the universal spanner of computing. But there are some



TK Solver is excellent for solving problems simply which otherwise would involve complicated contortions on a spreadsheet – but much of the power of TK lies in its windows, its procedures, and its language. To access those, you have to master the PC keyboard TK style, and get used to the way its various components interact.

computing knobs that even a universal spanner can't turn. When you confront such a task TK Solver could be the tool you need. It wouldn't replace the spreadsheet for most users. But there are many tasks which it does easily and well that are done poorly if at all by spreadsheets. Every reasonable sized company should have at least one copy of TK sitting about in case such a problem arises.

Product Details

Product: TK Solver
Distributor: At present we are unable to locate an Australian distributor. If anyone knows who's handling it now, let us know – it's too good a package to lose.

It can be turned to solving chemical equations, the design of helical springs, calculation of annuities, matrix inversion and complex numbers and can undertake those tasks with much greater ease than can a spreadsheet.

For engineers, mathematicians and the like, TK Solver is close to being indispensable. It can be turned to solving chemical equations, the design of helical springs, calculation of annuities, matrix inversion and complex numbers, and can undertake those tasks with much greater ease than can a spreadsheet. TK Solver was until recently distributed by Imagineering; at the time of press that agreement had been terminated, and we could not locate a new distributor. If anyone knows who's handling it now, let us know – it's too good a package to lose.

Lucid 3-D

LAST YEAR, the three dimensional spreadsheet was an unfamiliar concept. Next year, it will be commonplace, and most will acclaim Lotus for having introduced it. But, Lotus wasn't the first company to introduce a 3-D spreadsheet: that mantle belongs to Dac Easy Software with Lucid 3-D. There are many enhancements in release 2 of the package, the most important being an extension to Lucid's 3-D model, which is quite different to that used by Lotus.

There are some areas in which Lotus canes Lucid: Lucid lacks database features (which are considerable in the new 123), its graphics are basic. But as strict spreadsheets the comparison often goes Lucid's way. Its 3-D model is superior to Lotus for consolidation purposes – one of the main reasons that users clamoured for 3-D in the first place. Lucid's functions can be added to with user defined functions, allowing you to write functions that suit your work. It can be run memory-resident, allowing you to easily transfer information between it and other packages. Its auditing is superior, and its macros can do things that are well beyond 123 (as evidenced by 3-D Book-keeper, which was written entirely in Lucid macros – see the accompanying box item).

Lucid by default runs memory-resident, occupying 137K of RAM (including 63K for your data). However you can run it as a typical Dos package, and you can extend the room for data to up to 8Mb. Typing LUCID at the Dos prompt loads Lucid into memory, from whence it can be recalled with Left Shift-Control. The screen display is quite gaudy compared to the Lotus standard: the entire screen is bordered, with an inverse highlight, there are two lines at the top of the column headers showing the current cell, date, time and available memory, and column headers have borders clearly showing the width of each column.

There are three ways to invoke Lucid's menus: the traditional backslash, pressing F10 or Escape. The menu includes a prompter for Lucid's function keys, a Clipboard command that includes and extends what Lotus and others do with Copy and Move, and a 3-D command. The menu appears at the top of the screen, and overwrites the status lines and the first line of your data – which at different times is a pain. For example, Lucid's sort routine asks you to specify a sort column by letter, but the menu obscures the letters. That aside, the menus are well designed and easy to navigate around.

Models

A CONVENTIONAL Lucid spreadsheet differs little from a Lotus one, except that Lucid functions aren't preceded by the @ sign (unless you configure it that way). You simply type your equations or labels in, and the program differentiates between them automatically.

It differs substantially from Lotus when

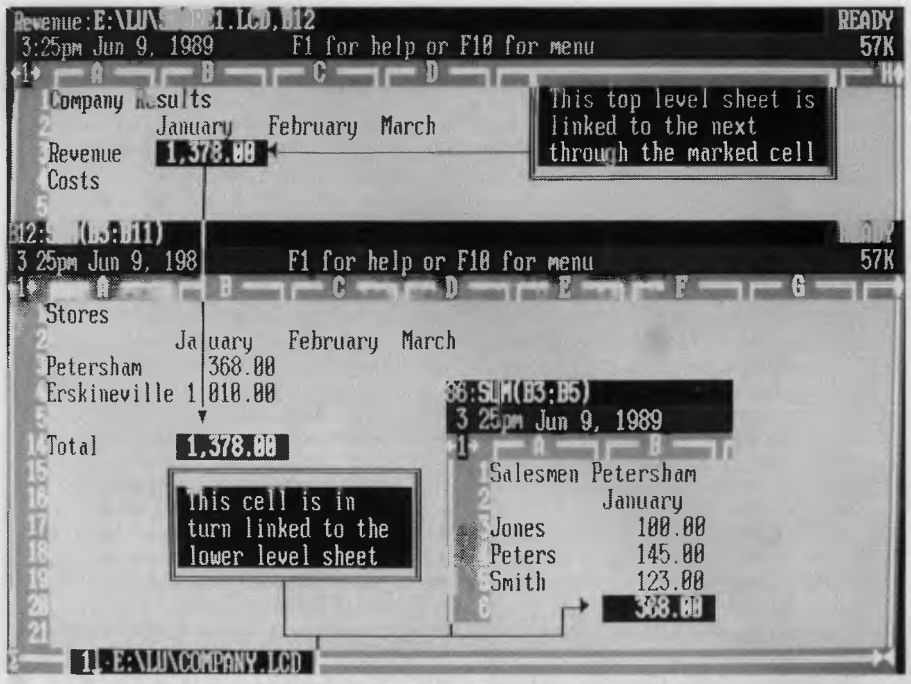
you enter the third dimension, and particularly when your purpose is consolidation of disaggregated data.

Take a typical consolidation process: consolidating sales by month, by product, and by store into company sales. With Lotus you'd make up a multi-page spreadsheet with one page per store, months along the top and products down the side, and sum each cell into a top page sheet showing company sales by product by month. Sum formulas on the top sheet would consolidate that information into total sales per month, per product, and overall total sales.

Problems would arise if you wanted to change the model later to include a breakdown of sales by salesman since that extra dimension doesn't fit into a cubic spreadsheet. You'd need to construct separate files for each store (with one salesman per page), and read the collated information for each store into quite a different kind of sheet.

With Lucid, you design the consolidated picture you want (sales by product by month for the whole company), create a range (sales of umbrellas by month), and then dive down into a lower level sheet using the numeric keypad's + key. There you'd record each store's sales of umbrellas by month, and have a bottom row that adds all sales together – for total company sales of umbrellas. Return to the top level sheet and Lucid automatically transfers this information to the previously defined range.

If you want to add an extra layer of information, such as the salesmen's results, you simply dive from the second level sheet (umbrella sales) to create a third level for salesman's results. With Lucid's model, there is no limit to the depth to which you can dive – and hence the degree of disaggregated information you can process.



Lotus gets its three dimensions from a spreadsheet which has pages (depth) as well as rows (height) and columns (width). Lucid's depth comes from 'diving' in and out of sheets, with the information in linking cells being automatically transferred 'up' the hierarchy. The effective difference is that Lucid sheets are easier to design and modify. With Lotus you have to design from the bottom up and get the design right first time, while with Lucid, you can design from the top down, and changing the design is easy.

Functions

LUCID HAS slightly less built-in functions than Lotus (it lacks a few of Lotus' depreciation formulas), but it more than makes up for this with the ability to define your own functions. The basic trick here is to enter the formula into a cell, give the cell a meaningful name, and then pass the necessary arguments to the formula. For example, you could replicate the standard AVG function by storing the formula SUM (Range)/COUNT(Range) in cell A1, call it AVERAGE, and then tell it the range.

This much could be done in Lotus. What Lucid has added is that your arguments (the range in the AVERAGE function) can be specified using %1, %2, up to %9 – place holders just like Dos uses in batch files. This lets you enter the function AVERAGE in any cell on the spreadsheet, give it the sum range and the count range, and the function will compute. The functions can be saved with a single spreadsheet, or saved in a library sheet and transferred into your working sheet using the clipboard. This makes Lucid highly user-tailorable – which would be of considerable benefit to actuaries, engineers and the like, who often require functions that aren't supplied in standard spreadsheets.

The package 3-D Bookkeeper is proof of what can be done with Lucid's macros. Lucid macros are stored in macro files, so they can apply to a number of spreadsheet files, not simply one. Macros can call other macros, they can pause for user input, verify what the user has entered and change processing on the basis of it. Lucid handles choice making with a menu-driven means of creating If-Then logic, which greatly simplifies writing macros in the first place (in addition to the auto-record feature). There is also a separate macro editor, called COMPMAC, which converts your macros to a pseudo-English and lets you edit them as you would a standard programming language.

Limitations

IN ITS FIRST release, Lucid's links between files were from one cell to another.

Product Details

Product: Lucid 3-D
Distributor: Peripheral Systems, 9/4 Campbell St, Artarmon 2064 NSW (02) 437 6255
Price: $149.95

Lucid is an excellent, full powered and well documented spreadsheet. Compared to the market leader, it is 'little' only in price, and for many applications, it may be a better buy.

3-D Book-keeper

THE FACT THAT a system like 3-D Book-Keeper can be written using spreadsheet macros is a tribute to Lucid's unique 3-D style, its macro language, and the macro abilities of 3-D's developer, Bill Aronson. Most accounting programs are written in databases, mainly because they are the only packages which are built to handle the kind of relationships between different sorts of records which typify accounting systems. When you post your monthly figures, for example, you are normally telling a database to transfer the totals for records concerning one month in one file to records in another file which hold consolidated amounts.

Lucid is the only spreadsheet which handles links between files as a matter of course: its link between files is the ability to take the values in a cell (or range of cells) from a lower level spreadsheet and enter them into one higher level sheet. This very naturally lends itself to cashbook consolidation. Entries in a monthly cashbook are summed; this summed total is returned to the consolidating spreadsheet.

To go from this possibility to a real cashbook system takes a decent macro facility and some equally decent programming. Lucid provided the former, while Bill Aronson has provided the latter. 3-D's target audience are bookkeepers who are currently using either a manual system or an unsophisticated spreadsheet cashbook, and who normally have to trot off to the accountant for monthly balances, profit and loss statements and the like.

The program makes use of Lucid's ability to turn off the typical rows and column layout, and to change the color of protected cells to provide a quick unspreadsheet-like display. Menus (with options that can be activated either by an Alt-key combination or by point and pick) cover the right half of the screen, but can be deactivated simply by pressing escape. The initial data level for Book-keeper is a layer of monthly expense and income spreadsheets. Entries made here (under macro control) are broken down into categories (of your choosing), for later consolidation. Any entry at this level will represent as a petty cash payment, a cheque, income received (or promised) and so on. The next level up is to reconcile this information with the monies recorded in your bank accounts. The program handles the situation where bank balance and records don't balance by tagging payments that have yet to be recorded, or cheques that haven't been deducted from your account.

Data is easily passed between the various levels using Lucid's built-in file linking, easily consolidating results up to the top level profit and loss statement. 3-D Book-keeper is also available from 3-D Book-keeper Pty Ltd, 5A New St, Bondi 2026 NSW, (02) 389 7009, and costs $499.

Release 2 extended this to allow links between one range and another range, which greatly increased the flexibility of the package, but there is still one more step to go. At the moment, any upper level sheet can have numerous links to lower level sheets, but a lower level sheet can have only one link to one upper level sheet. This puts a break on your ability to use the same raw information for a number of different purposes.

This makes it difficult to take different 'slices' of your information and analyse them, to look at your company's performance from a number of different perspectives; but Lotus is equally as rigid here, if not more so. If you want truly flexible multi-dimensional analysis, the only package for the job is PC Express; but it retails for over 20 times the retail price of Lucid.

Lucid is an excellent, full powered and well documented spreadsheet. Compared to the market leader, it is 'little' only in price, and for many applications, it may be a better buy.

Javelin

JAVELIN WAS probably the best promoted software launch in the history of PCs. Every computer journal, and many business journals, carried articles proclaiming it as 'The spreadsheet killer'. The crystal decahedron, Javelin's trademark and mascot, was everywhere. The hype has died down considerably since then, and Javelin Plus, as it is now known, is promoted today as an adjunct to the spreadsheet, not as a replacement.

The numbers you enter into a spreadsheet are essentially unrelated to each other: it's only the column and row headings you provide that indicate that cell B7 shows the number of raincoat sales in June, while B8 shows raincoat sales in July, and column B in general shows raincoat sales over time. In mathematical terms, the information we enter into spreadsheets is entered as constants or scalars, but frequently regarded as vectors – columns of related information.

Javelin supports two sorts of numbers: constants – things which never vary – or variables – which in Javelin, mean things which vary over time. So if you define the variable Raincoats in Javelin, it is automatically capable of holding your data concerning sales of raincoats over a designated time period..

This makes it far easier to define relationships between variables than it is with a spreadsheet, because the one formula relates all entries in one variable to all entries in another, not just one to another (followed by formula replication). Since Javelin's variables are time based, it's also easier to define time based relationships – such as your showing a staggered relationship between your sales and being paid for them. This is the area where Javelin is strongest: if the time flow of income is important, if you want to track sales against the likes of advertising expenditure, then Javelin is perhaps the best tool (it is certainly superior to a spreadsheet). However it isn't appropriate when you want to examine, for example, the relationship between sales and region – though it can consolidate such information more effectively than a spreadsheet.

Javelin's interface is built around its multiple views into your data. It loads with a split screen, with the top half showing a spreadsheet-like object called a worksheet, and its bottom half showing a 'diagram' – a tree-like sketch showing which variables in your database affect others. You enter variables into your model simply by typing an equation, into any view. The equation 'Overheads = Rent + Water Rates' both enters the equation into the system, and defines the three variables, with Overheads clearly being a derived figure, with Rent and Water Rates being undefined.

Rent would be monthly, which you can define either directly from the menus, or by showing a table view of the variable and entering monthly data (once defined, data can be entered into Javelin via almost every view – including the two graph views). Water Rates could be regarded as a constant, which you can define by a sec-

ond formula like 'Water rates = 400'.

That then presents Javelin with a conflict – how to add a monthly variable and a constant. You solve the dilemma by editing the formula to 'Overheads = Rent + Quarterly(Water Rates)'; Javelin can now perform the addition, and makes Overheads a computed monthly variable.

The variables can then be viewed from any of eleven perspectives – from the formulas, to a simple chart of a variable, a spreadsheet-like view, a table of data and so on. You switch between these views using Javelin's menu, which is invoked *a la* 123 by the slash key; you swap between your two on screen views using F6.

Views

JAVELIN SUPPORTS ten 'views', most of which suit data entry or analysis, some of which are intended to help debug a model. The most useful are formulas, table, chart and worksheet views.

The formulas view can be refined beyond showing all formulas, to display just those affecting a particular variable, or those which contain a particular variable. It is probably the most useful view (along with Errors) for designing a model, and auditing it. The table view shows three columns of the data for one variable, date by date. The chart view shows a bar chart of the data, which you can manipulate using the arrow keys to change already entered numbers up or down, and to add new months by moving sideways.

The worksheet view borrows a number of features from PFS:Plan. It shows a spreadsheet-like view of data from a number of variables, whose names are entered in either the horizontal or vertical axes. If you enter time-based variable names in the side border, and dates in the top, Javelin automatically fills the intersected cells with the relevant data.

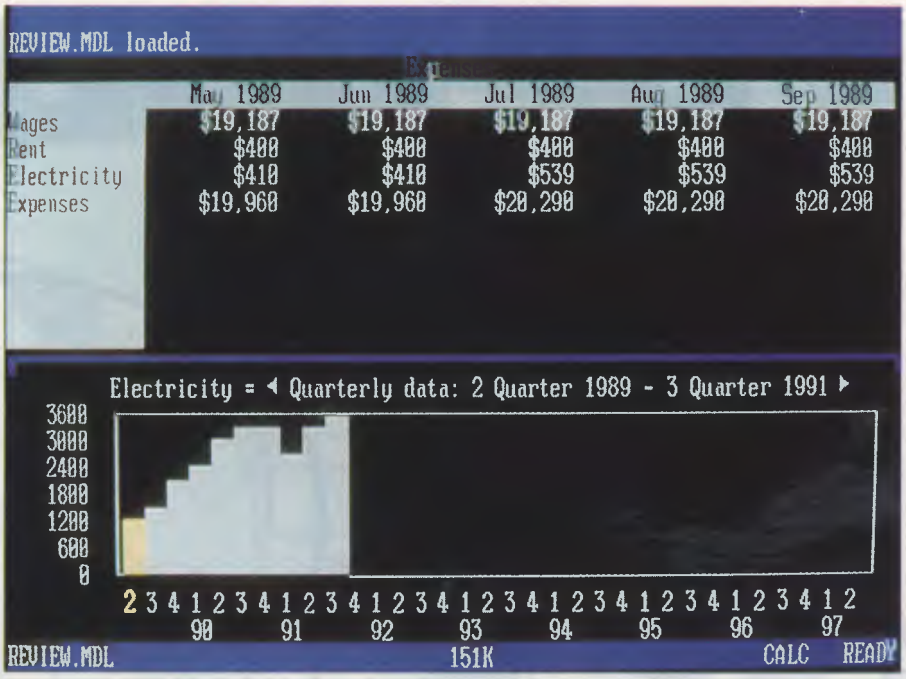
The top border is not limited to one row, as in 123; it can be up to five rows deep, with each row grouping the data beneath it. So if you enter the year 1986 into one row, and extend it over the headings Cost, Sales, Profit, the data beneath the headings will be restricted to 1986 only. Similarly, you can indent subheadings beneath headings in the side border, and automatically create new variables.

However this feature also encapsulates the major deficiency of Javelin: the lack of any dimension other than time. The relationships between those variables have to be entered separately (or through spreadsheet-like @SUM commands). It would be preferable if the single equation Profits equals Sales minus Costs could be entered once, and affect all products in one go. That would be possible if Javelin treated those products as sub-categories of Profit, Sales and Costs – as additional dimensions to time. But it does not: time is the only dimension Javelin can handle.

However it handles time very well, and a number of facilities called Building Blocks both augment its basic literacy in time, and overcome some of its limitations with other dimensions. The Time Delay building block lets you define a lagged relationship between two variables – you could show that 20 per cent of your invoices are paid immediately, 30 per cent after a month and 50 per cent after two months. The Rollup building block consolidates information from a number of models into one. The Lookup and Curve blocks both let you create complex lookup tables for rate structures and the like.

When applied to the task it does best – analysing time based data – Javelin is a useful analytic tool. It is not a replacement for a spreadsheet, but where time based relationships are paramount, it is very good.

Javelin has been taken over by Information Resources, the authors of PC Express, which is probably the ultimate multidimensional tool, but it lacks the elegance of Javelin and does not have automatic time handling built in. Javelin is unidimensional, but elegant and with automatic time processing. Hopefully the takeover will some day produce a product which combines the strengths of both packages. □



While there are cosmetic improvements to the original Javelin, the fundamentals of Javelin Plus remain the same (though copy protection has been dropped). When Les Bell reviewed the original Javelin, he pined for the ability to handle time periods shorter than a day for scientific work – that feature is still lacking (you could bend the user defined time periods to that purpose, but without the advantage of built-in conversion formulas).

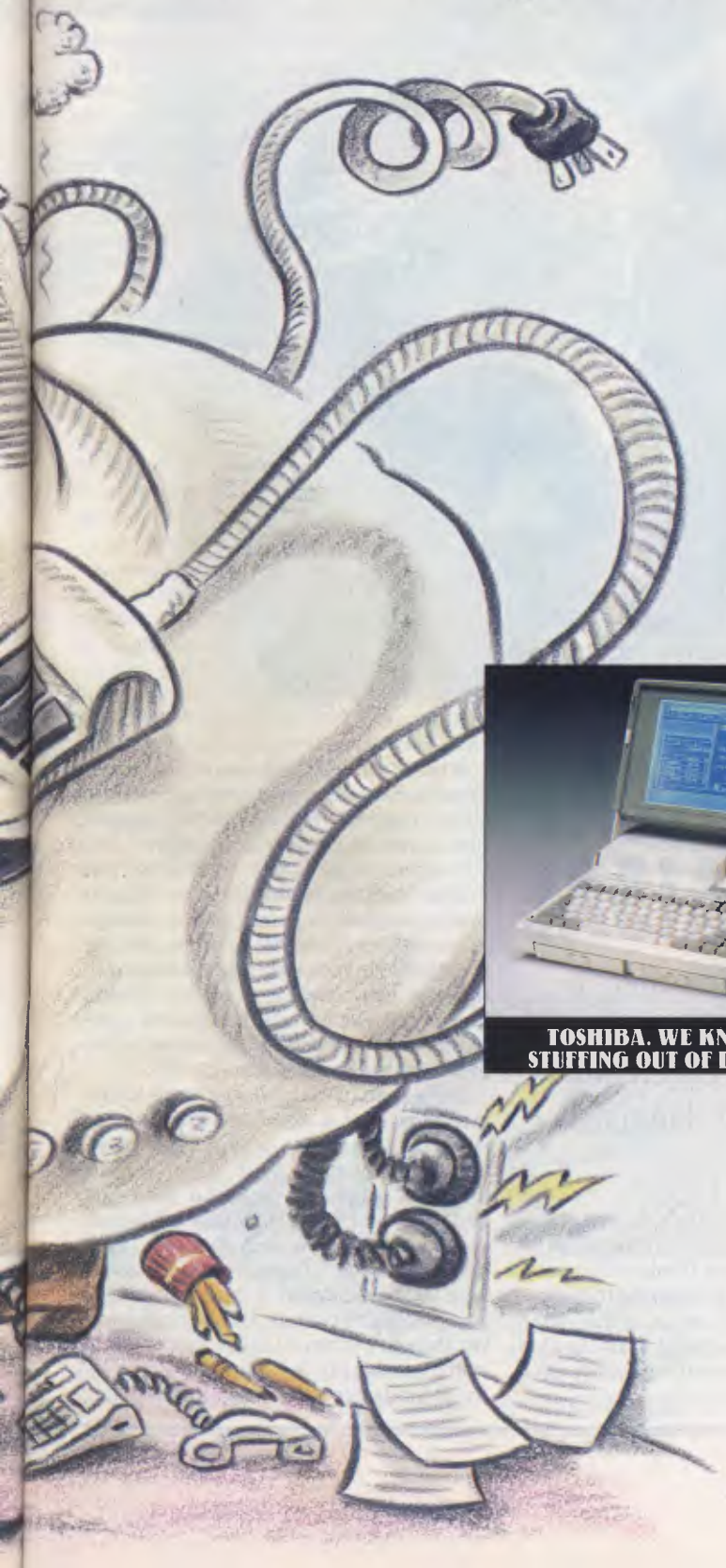
Product Details

Product: Javelin
Distributor: Sourceware
6 George Pl,
Artarmon 2064 NSW
(02) 427 7999
Price: $751 Javelin Plus
$415 Javelin

When applied to the task it does best – analysing time based data – Javelin is a useful analytic tool.

HOW TO GET R
OF UGLY FAT

ID OF 21 KILOS OVERNIGHT.



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FORTH

A CRITICAL APPRAISAL

Barry Kauler offers a thought-provoking view of Charles Moore's enigmatic 'engineering' language.

I PUBLISHED several papers on Forth back in 1981, subsequent to which my interest languished. Recently I've been drawn back, and this article is to tell you why. I have had a look at OS/2, the operating system IBM expects us to graduate to after PC-Dos, and I'm dismayed. I recall when PC-Dos only resided in 8Kb of RAM; now it needs 140K and OS/2 needs 1.5Mb – absolute minimum! Memory size is only part of the story however.

Any application you develop for real-time or other situations will need to run under the operating system, and this raises a whole lot of questions, unless the target machine is different from the development machine, which raises a lot more questions.

Various alternatives, such as the QNX operating system, have emerged, to provide more efficient real-time and multi-user/tasking development and run-time environments. (*QNX will be reviewed in* YC's *February issue.*) Forth is also intended to be a stand-alone operating system integrated with the language and development tools, and is a serious alternative to such complex combinations as C and Unix or OS/2. (I'm referring to professional implementations of Forth here; there are a lot of hobbyist versions that run under another operating system, such as Dos.)

Why, if the microprocessors I'm about to describe are so good, aren't they used far more widely? The answer to this question is lies in a rather sad reality.

I was one of those nuts who rushed out in 1984 and bought one of the first Macintoshes to arrive in Australia, even though it needed a 110 volt transformer. My gut feeling about the principles embodied in the Mac proved to be correct – though how would Mac have fared if a lesser company than Apple tackled its promotion? I mention this to illustrate a point.

I now want to address a far more fundamental issue that is at stake. I do feel that something has gone wrong somewhere; and I'm going to prove it. You may think that new and more powerful CPUs are what we need, but I shall now prove that the media and vested interests have hoodwinked us. Current microprocessors typically have several hundred thousands transistors and operate at high clock rates, yet the philosophy of these machines, in which complexity is built upon complexity, is fundamentally wrong. It is possible

to have simplicity and power. The same applies to operating systems, to an extent, but I'll tear down OS/2 and its friends in some future article; the immediate goal is to focus on CPUs.

Forth-on-a-chip

THIS ARTICLE is about Forth, but that is not the prime focus; rather the concepts behind the language that gives us a whole new approach to CPU design. A new breed of microprocessor has been evolving over the last couple of years, heralded by the Novix NC4016; these implement the Forth language primitives directly in silicon (not microcode). A humble little beast, the NC4016 consists of only 16,000 transistors, a baby compared with current high-density chips such as the 80386 which has 276,000 transistors, yet the Novix chip manages to execute programs many times faster. Nor is that the end of the story – the NC4016 was the first of a new dynasty of even faster Forth chips. Reduced Instruction Set Chips (Risc) are in vogue for those wanting maximum speed, but they are silicon monsters, and expensive.

I won't bore you with the fine details on how it works, but the end result is certainly of great interest. Most machine instructions (corresponding to a Forth kernel word) occupy only one 16-bit word of memory and fetch and execute in only one clock cycle. Since the clock may be 10MHz (the slowest version is 8MHz), that's ten million instructions per second. When one instruction is being fetched from memory, the previous instruction is being executed (possibly accessing the stacks via the other buses), so the main memory bus is extremely efficient, with few idle cycles. Note that the chip's architecture employs parallelism, and neither caching nor pipelining are used, which is a very important advantage in real-time work, where processing time must be always known accurately. (*For a more detailed discussion on parallel processing and Risc-based machines, see 'Risc-y Business' in December '89.*)

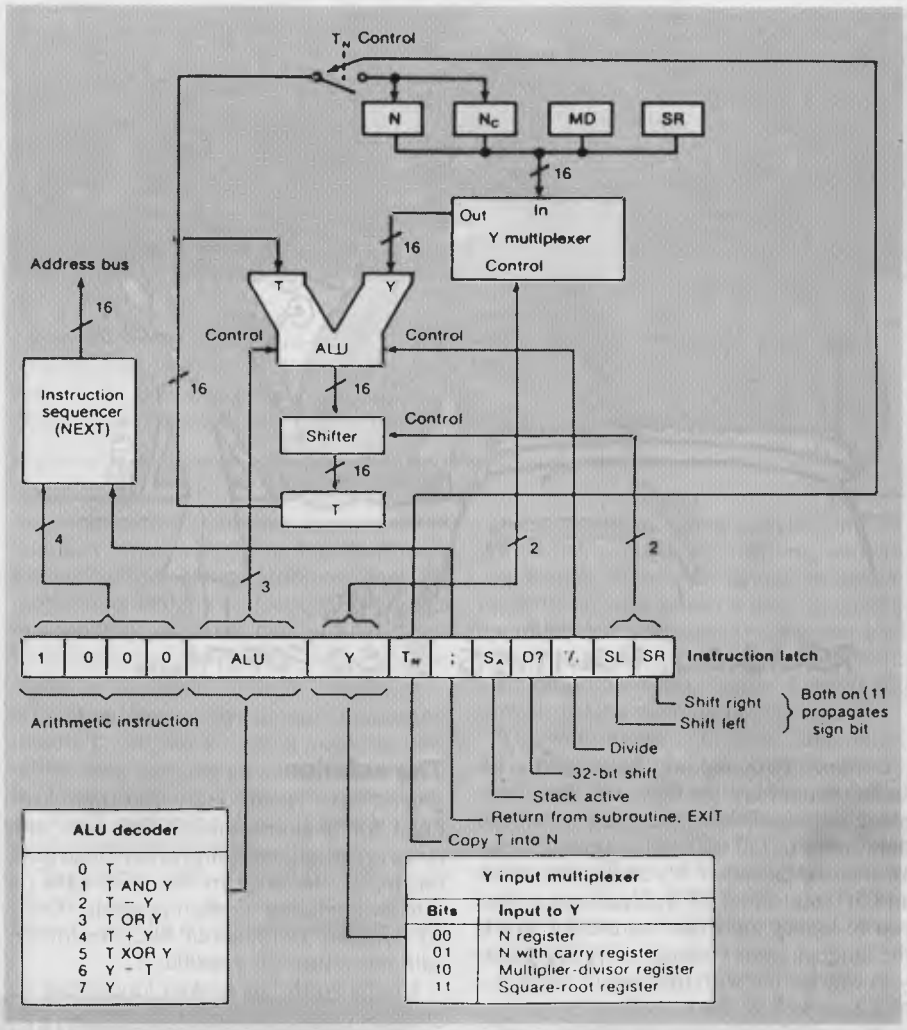


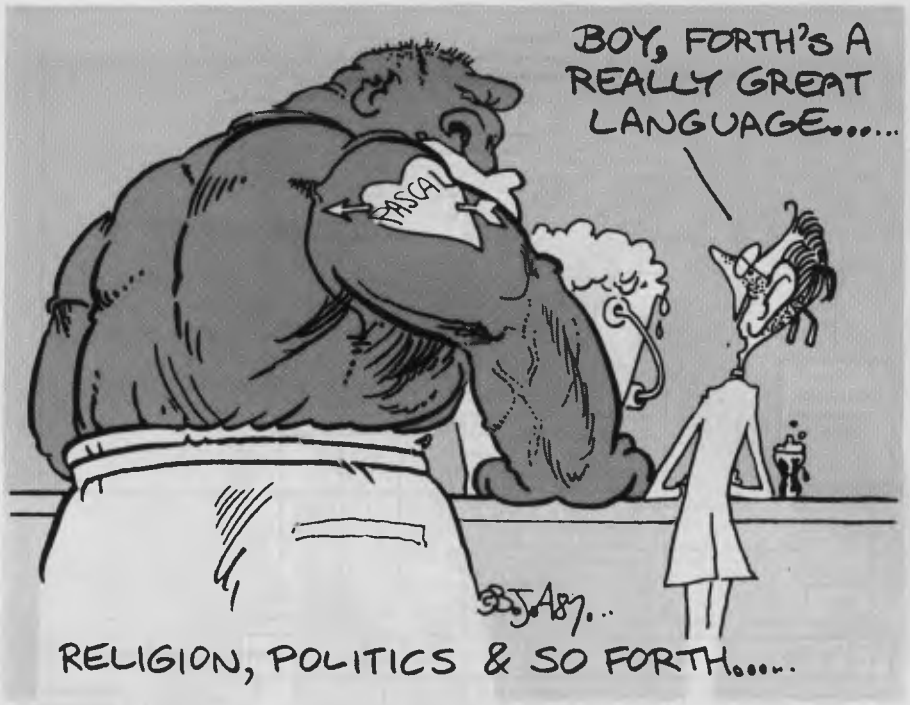
Figure 1. *The fully static CMOS NC4016 is a wondrous combination of go-fast features and design innovation. It has three separate external buses, all operating concurrently, which requires a lot of pins – 121 in fact.*

Problems with Forth

FORTH'S ACHILLES' HEEL has been its speed problem, caused by its extreme modularity. Each word of a Forth program is basically a subroutine, and the language encourages the programmer to write many short subroutines to make up a complete program. Each one has an execution-time overhead, so the more modular a program is, the more compact it becomes but the slower it executes. Linear coding is full of little segments that are the same, or can be made the same, as other segments –

```
seg. A          seg. B
seg. B          seg. B
seg. C          seg. A
seg. A          seg. C
seg. D          ....
```

– instead of inserting segment-A in-line repeatedly throughout the program, it could be referenced as a subroutine, thus saving memory. Forth takes this principle to the extreme, with subroutines that may only consist of a few instructions. In fact with Forth implementations on most computers, the execution-time overhead to call a subroutine and return may be comparable to or greater than the actual execution time of the subroutine itself. An abominable situation, and the bottom line is that Forth programs will not execute as fast as programs written in other compiling languages such as C or Pascal. Don't be fooled by the many published articles lauding Forth's amazing speed. Forth is an amazingly adaptable language, and it is possible to fine-tune benchmark programs to the point that they run fast; but that is not representative of normal programming practice.



Some Forth compilers are claimed to be faster than others, yet they still cannot approach that of other languages, unless they trade off all of Forth's compactness for the sake of speed. It's one or the other, and if you trade off compactness then you're losing the main feature for which the language was created in the first place – so why bother with the pain of using it – might as well go for C.

There is some marked difference between the performance of different microprocessors, with the more sophisticated such as the 68000 and LSI-11 being appreciably faster than the likes of the Z-80 or 6502, however, the fundamental speed problem exists for them all. Don't be fooled by CPUs with Forth on-chip – they're only standard microprocessors similar to the Z-80 or 6502, and all execute Forth very slowly.

I know these comments will draw a lot of flack, so let me cover myself a little. Another aspect of Forth is the incremental compilation, which is a natural, though not essential, outcome of its linked dictionary structure. It can be argued that this programming environment offers advantages similar to that of a Basic interpreter, that counter the disadvantage of slower execution speed. Hmmm, maybe. Switching tracks again, a good multi-pass C compiler has certain other advantages, apart from the slower development cycle.

The solution

ENTER THE NOVIX chip. The time-overhead for a subroutine call is only one clock cycle, and typically no overhead for a return, or one cycle in the worst case (is zero overhead for a return possible? Yes it is), compared with about 34 cycles for the call and return on a 68000.

Finally Forth has broken loose from its greatest limitation, and now almost paradoxically is capable of achieving code that is more compact than that achievable by traditional compilers, including assemblers and it executes at least as fast as code produced by assemblers. The cherry on the cake is that Forth is a high-level language, and programs can be written much faster than in assembler. It also forces structured programming.

Forth has traditionally been used for control applications, and has not been considered very suitable for heavy number crunching due to the bottle-neck of the parameter stack. The separate parallel buses remove this objection.

It is a superb language for writing compilers for other languages, for example, C is available for the Novix CPU, and it is *fast*! Novix Inc. has run a benchmark program compiled to run on the 4016, the popular Fibonacci series, and if we can believe them, execution is seven times faster than a 16MHz 80386 and five times faster than a 16MHz 68020. The 8MHz NC4016 performs Erastothene's Sieve three times faster than a VAX 11/780 and nine times faster than a 6MHz 80286 (the source code used in these tests was written in C).

C is particularly well suited to a stack-oriented machine, and if your thing is C, then thought should be given to the combination of C and the 4016. C has become extraordinarily popular, and must be considered on that basis alone – it is estimated that 40 per cent of programmers in the US use C.

The NC4016 has more surprises, such as data-streaming, that allows transfer of blocks of data between memory and I/O at one 16-bit word per clock cycle, under processor control. For a clock of 8MHz, that's 16 million bytes per second – who needs a DMA chip? How's this – multitasking built into the hardware? And this – the Forth compiler is about 4K, since most of the primitives are in silicon. And more – interrupt handling is fast, with basic handling time per interrupt being from 2 to 5 clock cycles. Another chip is available for vectored interrupt handling.

More Forth chips

THE 4016 STARTED the ball rolling, so to speak, and other chip manufacturers jumped on the bandwagon. Harris Corporation have released the RTX2000, with technology licensed from Novix, which sports such enhancements as on-chip stacks and hardware 16/32-bit multiply in only one clock cycle. Incidentally, the 4016 does a 16/32-bit multiply in 22 clock cycles, which is 2200ns with a 10MHz clock. Harris report that their RTX2000 will do floating point arithmetic at about the same speed as the IBM-PCs dedicated 8087 arithmetic coprocessor chip. The Harris chip has three 16-bit timer-counters, 14-input interrupt controller, and comes in an 84-pin PGA package.

Recently Harris released a low-cost chip, the RTX2001, to compete against the 4016. It is a 16-bit machine, and was state of the art in Forth chips until the recent arrival of a Silicon Composers' 32-bit chip, the SC32. It is a CMOS design, with only 34,000 transistors; both the address and data buses are 32 bits and operation speed is up to 10MHz, with one-cycle instruction execution. I don't at this stage have any speed tests on the SC32.

You may have a nagging doubt about all of the above seemingly impressive figures. Of course CPUs with 100,000 to 1,000,000 transistors on-chip employ all sorts of go-fast architectural features, so why should a Forth implementation such as the 4016

fare any better? The answer lies in the architecture of the language itself. Stack-based languages are inherently fast. The implicit addressing by instructions of parameters on the stack minimises the shuffling (variables, constants, pointer, and so on) to and from memory. Actually it is possible in theory to design optimising compilers for any language that can generate fast stack-based object code, especially C, but Forth makes the compiler's job easy.

Also the Forth chip is a Risc processor, to an extent, which has been shown to be more efficient than the philosophy of adding more and more complexity to the instruction set. Another factor is that Forth offers the closeness to memory and precise control as achieved with assembly coding (resulting in compact and fast code) while also being a relatively high-level language.

If there's a spark of interest showing in your eyes, perhaps some more notes about the language itself are in order. Forth has been described as arcane, esoteric, cryptic, and just plain awful, yet I use the ruddy thing, along with many other seemingly intelligent people. Basically we can summarise the pros and cons as follows:

Advantages – Extensibility and meta-compilation, interactive compilation and precise control, reliable debugging, rapid programming, both a high-level and a low-level language, potential for extremely compact object code, very fast execution on new chips, transportability, environment independent of Dos, development environment can also be run-time, optimised for real-time, especially on new chips.

Disadvantages – Reverse polish notation (postfix), the stacks are a pain to use, rather long learning curve, poor readability, fixed point arithmetic only with standard Forth, poor error checking by compiler, poor development tools/utilities.

The extensibility of Forth is truly amazing, yet not only can the compiler be extended, but the compiler/interpreter itself can be redefined, using a meta-compiler. With Forth you can do anything, and you can readily change the language beyond recognition and make it into a custom compiler that does exactly what you want and no one else will be able to understand your programs except you – a wonderful way of making yourself indispensable!

You want a new data type? Then define it! Arrays, strings, complex numbers, whatever type you require. As much as you may appreciate the advantages of structured programming, don't you sometimes paint yourself into a corner, and wish you had a good old GOTO? Standard Forth doesn't have it, but no worries; create your very own –

```
: GOTO R> DROP EXECUTE ;
```

Whenever GOTO is encountered during program execution, the address of a word is expected to be already placed on the stack, and control branches unconditionally to that word. You can even create Fortran's old unstructured Arithmetic-IF statement if the fancy takes you.

I've had a whinge about the direction of personal computer architectures, and also shown that we are not necessarily locked in to the predominant philosophy of building complexity upon more complexity (bandages over bandages), as heralded by a bit of lateral thinking from the whizz-kids at Novix that has resulted in a CPU that brings us power beyond the latest super-chips, while retaining simplicity and economy. As Charles Moore, the inventor of Forth, and one of the greatest lateral thinkers of them all, often said, 'Remember to KISS!' – Keep It Simple, Stupid! □

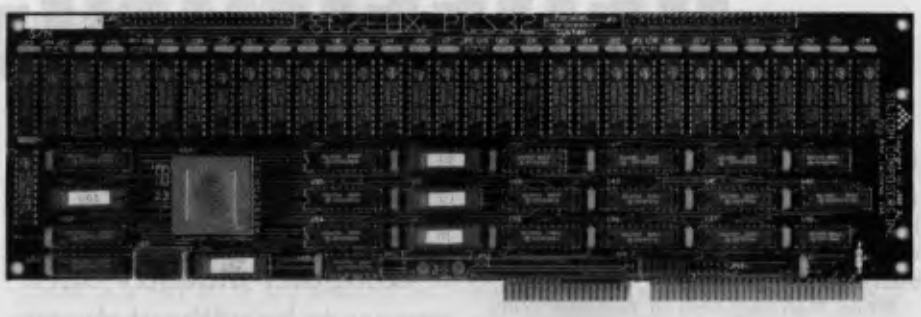


Figure 2. Harris' low-cost 16-bit chip, the RTX2000, was state of the art in Forth chips, until the recent arrival of Silicon Composers' SC32, a CMOS design with only 34,000 transistors. Both the address and data buses are 32 bits and operation speed is up to 10MHz, with one-cycle instruction execution.

For Forth . . .

THE NOVIX FAMILY is available from Energy Control (PO Box 6502, Goodna 4300 Qld), and can be supplied 'made up' in various forms, such as on a board for the STD-bus, as a coprocessor for the IBM-PC, and as a stand-alone development system. Various implementations of Forth are available, including those with a floating point package and multi-tasking/multi-user support (for example, PolyForth from Forth Inc. (2309 Pacific Coast Hwy, Hermosa Beach, CA 90254 USA).

Maestro Pty Ltd, the well-known Australian manufacturer of modems, also make a 4016-based development board for the IBM-PC. There is a rumor that they plan an RTX2000-based board also. Their address is Calool St, South Kincumber 2256 NSW.

The Harris RTX2000 is available from VSI Electronics Pty Ltd (16 Dickson Ave, Artarmon 2065 NSW). A complete description of hardware and software for the RTX2000 from a variety of US vendors is in the newsletter *RTXPress*, May 1989, published by Harris Semiconductor (PO Box 9128, Cathedral Station, Boston, MA 02118 USA).

The 32-bit SC32 is available as a coprocessor board for the IBM-PC XT or AT models, from Silicon Composers Inc. (210 California Avenue, Suite K, Palo Alto, CA 94306 USA).

If you want to get involved with Forth, I suggest a good move is to join the Forth Interest Group, PO Box 8231, San Jose, CA 95155 USA. Annual foreign membership is US$42. *Your Computer* columnist Roy Hill, editor of the excellent 'Forth Column', has the public domain FIG-Forth available, for a nominal handling fee. Called F-PC, it is a five-disk set and runs on the IBM-PC. Write to him, care of YC if you are interested.

REDEFINING PCs

SOMETIMES THE frenetic pace of the personal computer industry can appear to be without rhyme nor reason. However, there are a number of trends which point to the future directions of the market.

While manufacturers of personal computers make available new technology, it is the rate of adoption by users that determines the commercial success of any new technology. Put simply, before the personal computer can become truly 'personal' it must become smaller, lighter, easier to use, and more powerful.

Tremendous growth of sales of portable computers, in particular laptop models, is evidence that personal computer manufacturers, such as Toshiba, have been successful in addressing these user issues.

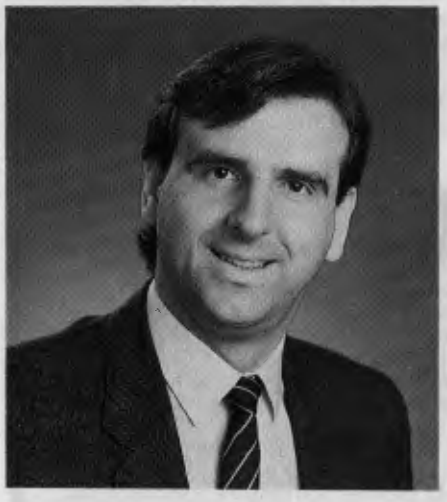
In 1990, a powerful personal computer does not have to take up three-quarters of the desk. Today's laptops can be picked up and taken wherever they are needed – be it in the next office or interstate. The move toward smaller, and more portable computers is based upon sound reasons. Logically, office space is at a premium, and working areas are not optimally utilised when so much space is dedicated to a desktop computer. Laptop computers take up a fraction of the space of desktops, and as an added benefit, can be set up instantly.

It is in the areas of personal productivity where the PC has had its biggest impact. Spreadsheets, databases, business graphics, desktop publishing, and even word processing have revolutionised the way that we do business. Now, the laptop personal computer extends the usefulness of these applications to a plethora of new situations. Personal productivity is being enhanced as never before, allowing more information to be manipulated quicker, thus allowing more time for analysis and decision making. Reinforcing this trend is the availability of new software which optimises the benefits that portability brings to the user. Examples are sales force automation software such as ACT, personal database and planning tools such as Lotus Agenda.

With products such as these, people have become dependent upon information that is within their computer. The laptop is becoming synonymous with the personal diary system, calculator and dictaphone. In other words, the laptop computer is becoming the executive's personal assistant.

Sometimes the frenetic pace of the personal computer industry can appear to be without rhyme nor reason, but Toshiba's Mike Clarke has spotted a trend.

Of course none of this is possible with a desktop computer unless you have muscles and a trolley. This means that all work is conducted in the office, thus leaving less time with the family or on the golf course.



The market is moving toward smaller computers because they offer choice to the user. No longer is the user tied to the desk to produce documents, reports, and presentations. In addition, there are many personal benefits in being able to go home, spend time with family or friends, and complete work later. Not only is more achieved, but it is done in an environment which is personally beneficial to the user – a case where computers can help to improve the quality of life. ***– Mike Clarke, Toshiba's industry marketing manager.***

Productivity gains

THE PRODUCTIVITY gains that can be achieved by using a laptop can be outstanding. Laptops are synonymous with people on the move – airports, hotels, planes, and even taxis can become workplaces. There are obvious advantages for using time which would otherwise be wasted, but productivity advantages are clearer for those who do not travel.

The market is moving toward smaller computers because they offer choice to the user. No longer is the user tied to the desk to produce documents, reports, and presentations. The user can choose where and when to work. In addition, there are many personal benefits in being able to go home, spend time with family or friends, and complete work later. Not only is more achieved, but it is done in an environment which is personally beneficial to the user – a case where computers can help to improve the quality of life.

There is no doubt that smaller and more portable computers will become standard. For example, Toshiba recently announced a 386SX based product that is a kilogram lighter than the 286 based version. Allied to the miniaturisation of technology, to make it easy to move, is the trend to make the whole issue of using PCs easier. The origins of this trend have been attributed to Apple with the Lisa.

The application software itself has been made easier to use through the use of streamlined interface, such as pull down menus, and on-screen help facilities. Even the installation of software has been made easier with self-installation procedures. These features make people productive with computers quicker, and with software packages offering 'Read Me First' or 'Getting Started' tutorials, it is also possible to become efficient quickly.

Operating systems

OPERATING SYSTEMS have moved with these changes in application software, and have developed towards being easier to use. The familiar, but often daunting, Dos prompt can be by-passed in favor of menus with the advent of Dos prompt, which in turn can be by-passed in favor of menus with the advent of Dos 4. For those who do not have Dos 4, there are still advances.

The window style, or graphic interface operation, that Apple pioneered, is per-

haps the ultimate in ease of use. This has been available on Dos machines for some time via Microsoft Windows, Windows 286 and 386. This trend is nowhere more clearly demonstrated than in the development of OS/2, where a full graphic interface will be available. The introduction of OS/2 Presentation Manager is a clear indication of the direction of PC operating systems – toward complete ease of use.

It may be portable, and easy to use, but is it going to be powerful enough? Another trend in the PC market is toward more power. When compared to a few years ago, the thought of a 32-bit machine, with 6 megabytes of RAM, and 100 megabytes of storage, has changed dramatically. At that time, such a machine was the size of a filing cabinet, and was not a PC by any means. Today, these machines are common as stand-alone personal computers.

As 286-based machines were introduced, they soon replaced the XT as the standard in business. Slowly, the same process is now occurring, as the '386 or 386SX based machines replace the AT. This level of increased power is not necessary for every application, but as graphics become more of a feature of so much software, the capabilities of the machine are being used.

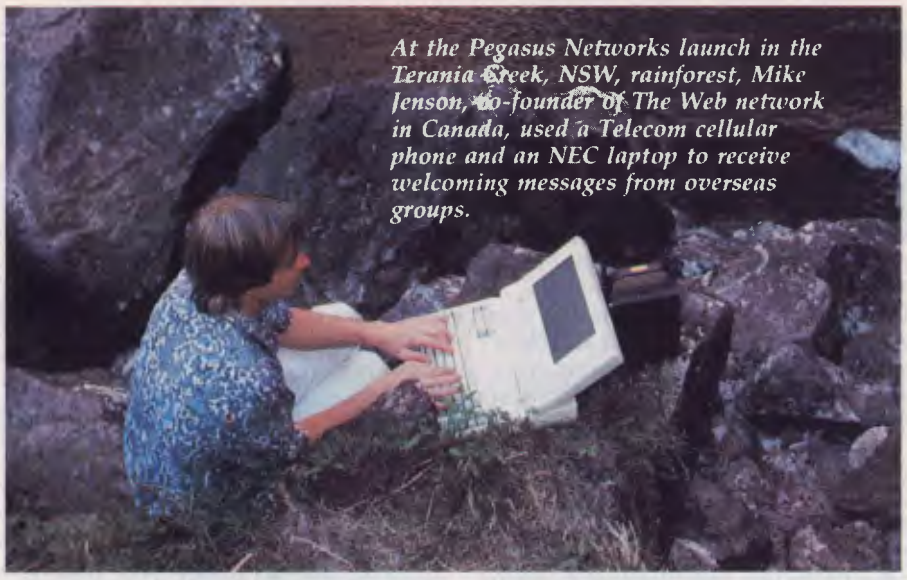
There is a conflict in the trend to increasing power whilst reducing size and weight. The conflict is one which manufacturers have to resolve, and resolving it they are. *Your Computer* magazines' Computer of the Year (see 'Personal Computer of the Year' in June 1989), the T5200, is a 20MHz '386, 100Mb machine which weighs only 8.5 kilos – a far cry from the filing cabinet!

Many users are moving away from the very large centralised processing systems of the past, and towards local processing with power at the user level. This means that applications such as office automation are becoming LAN-based rather than mini-based. It also means that it is more common for a PC to be connected to a host, be that file server or mini, with the data being manipulated locally rather than at the host. The implications of this, again, present a conflict for manufacturers. The increased power presents no conflict because localised processing requires such power. The trend to ease of use has been accommodated at the application software level with communications software offering the best in ease-of-use features such as pop-up windows.

However, there is a possible conflict between the size and weight of the machine, and its ability to connect into other environments. In practice, this does not become a trade-off. Laptop computers are as connectable as the desktop models, and fit comfortably into distributed processing environments.

The PC market is moving forward at an amazing pace. New developments are constantly being made available which are greeted with varying degrees of success. However, the way that the PC market is moving does suggest that the sales of laptops will increase at an even faster rate, as more and more users replace existing systems. PCs will become smaller, lighter, more powerful, and easy to use and connect – and the laptop is certainly redefining the term Personal Computer. □

There is a conflict in the trend to increasing power whilst reducing size and weight. The conflict is one which manufacturers have to resolve, and resolving it they are. YC's *Computer of the Year, the T5200, is a 20MHz '386, 100Mb machine which weighs only 8.5 kilos – a far cry from the filing cabinet!*



At the Pegasus Networks launch in the Terania Creek, NSW, rainforest, Mike Jenson, co-founder of The Web network in Canada, used a Telecom cellular phone and an NEC laptop to receive welcoming messages from overseas groups.

PEGASUS
LINKING THE WORLD

Ian Peters describes a new application for PCs and a worldwide network – the environment!

THESE DAYS, if you turn up at an international meeting to discuss the fate of the oceans, rainforests, or other environmental issues, chances are that many participants will be armed with laptop computers and modems, and using the worldwide resources of APC (Association for Progressive Communications) Networks to communicate to the media, colleagues, and campaign officers all over the world.

These types of users represents the origins of Pegasus Networks in Australia, which, from its Byron Bay offices, offers a wide range of computer networking facilities for the Australian community. These facilities include access to academic network computing conferences which have not been available to the general public before, environment, peace, human rights and development information, a network for homeopaths, fax and telex services, private and public conferences, database access, and cheap global communications with users in over 70 countries. Access is via dedicated X25 lines, making connection (at the cost of a local call) possible from anywhere in Australia.

Since the APC Networks took on a global feel in 1985, with links being established between GreenNet in Europe, the Web in Canada, and EcoNet and PeaceNet in the United States, many other countries have joined the system to provide a global network that is now used by World Wildlife Fund, GreenPeace, Friends of the Earth, Amnesty International and other human rights, environment and peace groups all over the world. Users are now connected in over 70 countries, and range from large international groups, to research organisations and ordinary people wanting to be involved in campaigns to improve the world.

Community email

APC NETWORKS aim to create a low cost, but highly efficient email and conferencing service for community groups, and to popularise communications technology via computers. To make the service cheaper for users, APC encourages the establishment of national host computers by providing technical help and advice on low cost hardware set up. National host computers provide services for people within their country, and links to the other network members several times daily. Each national network is autonomous.

Pegasus Networks in Australia, when it commenced operations in late 1989, became the seventh national network in the scheme, joining networks in the UK, USA, Canada, Brazil, Sweden and Nicaragua. On-line for connection during 1990 are USSR, the Philippines, New Zealand, Kenya, Italy and several other countries.

Before Pegasus Networks commenced

```
Mail? ?

To read a message, type the number of the message.
Other Mail commands are:

u   show next (u)nread msg              i * show the (i)ndex page
h   provide more (h)elp                 w *
(w)rite/send/reply/forward msg
q   (q)uit, updating folder             x   e(x)it folder with no update
n   show the (n)ext msg                 p   show the (p)revious msg
s * (s)ave msgs in another folder       l   (l)ist your folders
d * (d)elete msgs                       ls  (l)ist (s)torage used by folders
und (und)elete a recently deleted msg   g   (g)o to another folder
r * (r)edraw/read msgs                  y   has recipient read my mail (y)et

Commands marked by '*' take an optional message list.

Optional message list: if omitted, the default is the current
message (except for "index", which defaults to all messages).
Otherwise, a message list is a list of message specifications,
separated by spaces, which may include:
```

Ian Peter uses a Telecom cellular phone, NEC laptop, Worldport 1200 modem, and ProComm to contact the world whether he is at Protestor's Falls, Terania Creek, or the office.

operations in Australia, costs of connecting to the network were extremely high, with the few Australian participants paying quite exorbitant amounts that were outside the budget of most individuals and community groups. Now, however, hundreds of Australians have subscribed to the service and can get international, and Australia-wide communications for less than the cost of STD, ISD, or even 'snail mail' (that's what the electronic mail enthusiasts call the old style postal service). Off peak rates from anywhere in Australia, for instance, are 13 cents per minute – 'an honest 13 cents, that includes data transmission and access, and STD charges. We have deliberately adopted a pricing structure where the customer is aware of what their bill is really going to be', says Network managing director Ian Peter, who became involved because of his work on global rainforest campaigns throughout South-east Asia and the Pacific region, including Daintree, Terania Creek, and the Penan campaign in Malaysia.

He suggests two major reasons for the rapid growth of this network. 'Firstly, I think people looking at these issues realise we are no longer living in isolated communities around the world. Chernobyl, for instance, did not respect national boundaries – it had a profound effect on neighboring countries. Similarly, you can't look at the problems of Bangladesh without looking at the underlying causes of their problems, which come from India and Nepal.

'Many of the problems we face today are like that. The rainforest problem won't be solved without global co-operation. Nor will nuclear issues, ozone problems, and so on – we *need* global co-operation, and to get that, we need global communications.

'The second factor is that many of us seeking solutions to our problems realise the efficiency of computer communications. Energy consumption is very low, speed of delivery is very high, and environmental impact is low. As well, we have to realise that normal mail delivery is, in essence, a forest product that has been toxically treated, and delivered from origin to destination by carbon dioxide – not exactly the answer to environmental problems!'

The network has many facets. Apart from electronic mail, there are more than 800 global conferences, in which information on various issues are exchanged. 'All in all', noted Peter, 'this amounts to the equivalent of a few *Encyclopaedia Brittanicas* of information on these issues – and that's growing rapidly.'

The typical APC hardware configuration starts with a '386 compatible, with a minimum 8 megabytes of memory and one gigabyte of hard disk. The Pegasus installation, in addition, has a second '386 for backup, and uninterrupted power supply, spike protection, and even a power generator for total blackout – this ensures uninterrupted 24 hour service. (Mylex motherboards from ICT are used in Australia – they can be contacted at 483 Riley St, Surry Hills 2010, NSW; prices start at $2260 for a 20MHz 80386 board.)

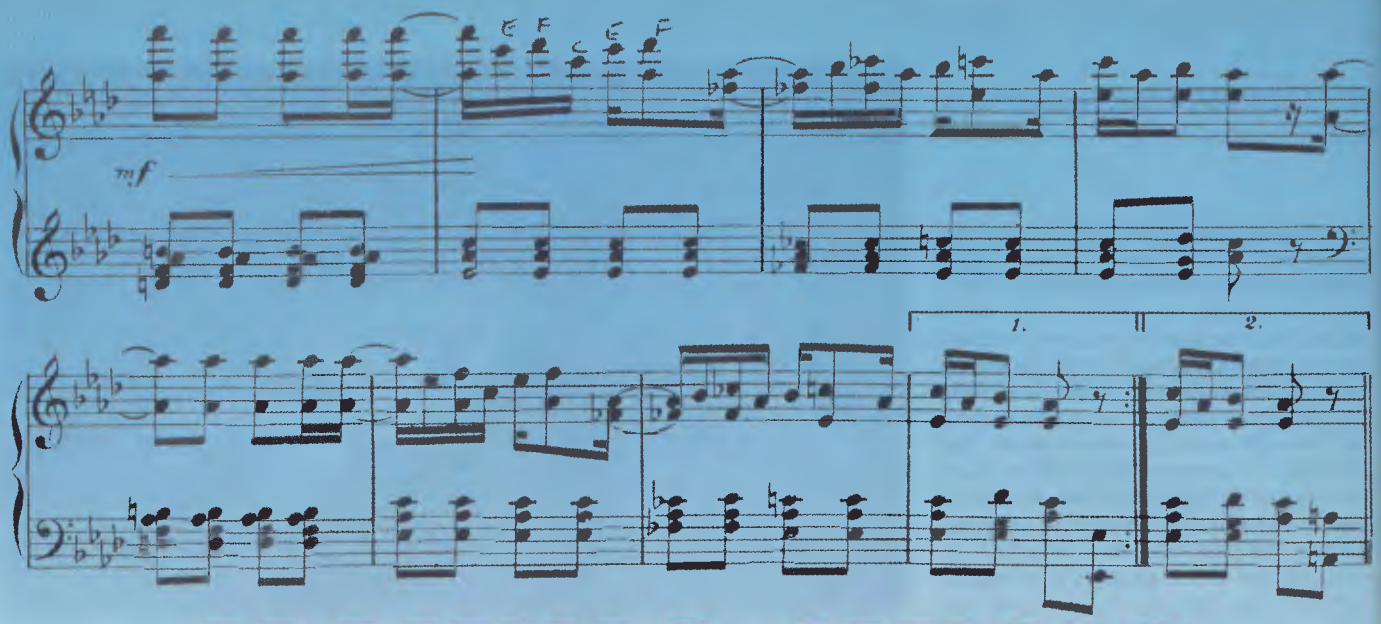
The software is based on Unix, utilising specially designed conferencing software developed from Notes (formerly an educational package) and databases under Informix. In countries where packet switching networks are available, these are utilised, as are high speed Trailblazer modems for long distance access. Pegasus boasts that users will never get an engaged signal, as they monitor lines carefully to ensure that the number of available lines stays above system usage.

The joining fee is $30, and minimum monthly fees are $12; the only other costs are on-line charges. All in all, Pegasus Networks offer a value for money communications system, both in Australia and overseas, and a particularly valuable service for community groups. A special phone service is available to help you get connected. If you are interested, you can contact Pegasus Networks, PO Box 424, Byron Bay 2481 NSW; (066) 85 6789. □

```
        n       message number n
        .       the current message
        $       the last message
        *       all messages
        n-m     messages from the nth to mth (inclusive)
        user    message from a particular user
        /pat    messages containing the pattern "pat" in the subject line
        :c      all messages of type "c", where c is one of:
                 n - new messages
                 o - old messages
                 r - read messages
                 u - unread messages

Mail? q
Held 58 messages in folder (incoming)
```

Pegasus has made it easy for users – all it takes is a local call from anywhere in Australia (via Austpac) to access the network; then, the menu-driven interface offers help for all levels of patrons.



MAKING MUSIC WITH YOUR PC!

If you'd like to blow the roof off with Scott Joplin and a home made speaker for your PC, then listen to Tom Moffat . . .

WANT YOUR COMPUTER to sit up and roar? Here's a simple project to install an external speaker for an IBM compatible; it works for Microbees, too. If you don't necessarily want a roar, there's a rudimentary volume control. The project is necessary because the original purpose of the speaker, in both the PC and the Microbee, is to beep. Trouble is, there are many programs coming out nowadays that take control of the speaker's 'beep' software and make it produce fairly sophisticated music and/or sound effects. The computer's speaker, however, is quite small, and it's most likely mounted as an afterthought somewhere within.

Some PC compatibles have a little speaker grille on the front for the sound to come out; the Microbee has a grille on the bottom. My Unitron PC doesn't have an opening for the speaker at all; the sound is meant to sort of leak out through the seams, I think.

Inside the PC

THE SPEAKER driver circuit in a typical PC is shown in Figure 1. Working through the circuit backwards, the speaker connects between the computer's five volt power supply and the collector of a small switching transistor. When the transistor switches ON, the collector is pulled toward the emitter (that's the line with the little arrow on it) which is in turn connected to ground. The speaker then has 5 volts DC across it. When the transistor switches OFF, the collector is released, there's no more ground, and the speaker voltage is removed. A tone is produced when the transistor is switched on/off/on/-off several thousand times a second. The tone is a 'square wave' which is a pretty raspy old sound. The 0.1mF capacitor between the collector and ground is there to smooth off the edges a bit.

The transistor is switched on by feeding a little current into the base (that's the line coming out the left side of the transistor symbol in Figure 1). In many PCs, the switching current comes from a logic gate integrated circuit used as a current 'driver'. This IC is helped along a bit by an extra resistor connected to the +5 volt power supply.

Had I designed that circuit I would have put another resistor between the logic gate and the base of the transistor, to limit the amount of current allowed to flow. It's a kind of safety valve. As that circuit stands now, the logic IC can supply heaps of current if the transistor demands it as would happen if the collector were connected straight to +5 volts without the speaker being there. This would happen if the speaker were somehow shorted out – so beware! Do not allow the speaker wiring to become shorted or the transistor will most likely blow. It would only cost about 10 cents to replace it, but you would have to completely disassemble the computer.

The Microbee speaker driver is similar, with a few exceptions. There is a resistor in the base circuit, to limit the current. There is another resistor between the collector and the speaker, to further limit the current through the transistor. And, the other side of the speaker is connected to +10 volts instead of +5.

The circuit diagram of a late-model Microbee system boards shows that they have abandoned the switching transistor scheme, in favour of a proper little audio amplifier. From the way it is wired up, it appears to be an LM386 type integrated circuit. There is a volume control leading into this amplifier. This is probably essential because an LM386 can produce several watts (deafening!) when driven hard.

External speaker connection

ACTUALLY, THERE are two options here: a volume control, and an external speaker-/stereo connection. You can install either one, or both. Figure 2 shows the wiring required for both options. The volume control is implemented with one resistor and a switch. The resistor can be inserted in series with the lead to the speaker, where it soaks up some of the power otherwise destined for the speaker. The switch simply by-passes the resistor, so all the power goes to the speaker. This means the speaker is at full volume with the switch closed, and at reduced volume with the switch open. You should experiment with various resistor values to determine what resistor is needed to bring your speaker down to what you feel is a nice 'low' setting. A 100 ohm resistor is a good starting point.

By now you're probably wondering why we are using a two-position switch instead of a traditional rotary-type volume control. The reason is that potentiometers in the 100 ohm range are big, expensive and troublesome. You would have a struggle finding somewhere to mount one, and the quality of the ones I've seen recently suggests they wouldn't last very long.

The external speaker connection is implemented through a 3.5mm 'shorting' type socket. 'Shorting' means that the circuit is passed through to some other device when no plug is inserted in the socket. It does not mean that the speaker line should be shorted. This would surely blow the transistor, on a PC at least.

A very important point to make is that any metal parts of the socket must be insulated from the rest of the computer. There are sockets available that are made of some kind of black plastic, filling this requirement nicely. I looked in a couple of catalogs to see if I could find an instant source for you, but plastic sockets didn't get a mention. As usual, what you need never seems to be there! Looks like you'll have to sniff around some of the electronics shops. You could also get around this problem by finding some plastic part of the computer to mount your socket on. In a Microbee this is easy, since the whole thing is plastic.

The volume control switch and the speaker socket will each need a hole drilled somewhere on your computer's case. Be extra careful when drilling holes in a metal case; you don't want to get any filings into the computer's works! Again, take special note that the speaker socket must be insulated from the computer's metal case, since the outside of the socket will have voltage on it.

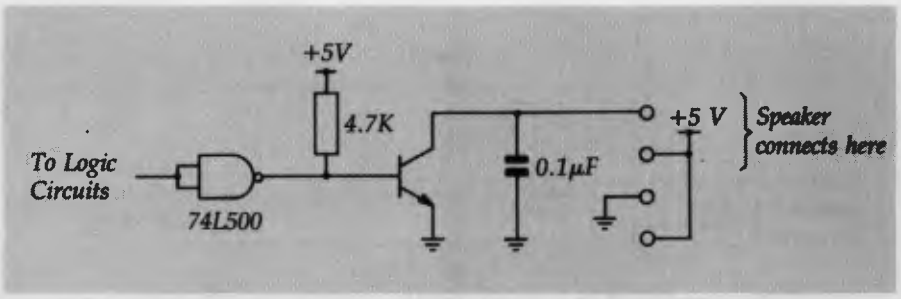


Figure 1. Shown here is a typical IBM PC speaker driver circuit. In many PCs, the switching circuit comes from a logic gate integrated circuit used as a current 'driver'. The diagram shows four terminals in a row where the speaker connects – these represent a four-pin connector that will most likely be sitting on your computer's system board near the left-hand front. There will probably be two two-pin connectors attached here, each one with wire leads. One pair of leads will go to the speaker and the other to the light that comes on when the computer is switched on.

Now that you have an idea what's happening, and have the parts installed, it's time to wire it up. First get an ohmmeter or some other way of checking continuity, and make sure all the metal bits of your socket are really insulated from the computer's metalwork.

Referring to Figure 1, trace the leads to the speaker, and determine what you will have to do to get to the solder connections. You may have to remove the speaker, but this isn't a big job; PCs are designed to come apart fairly easily. With a Microbee, remove the system board and the speaker will be underneath – dead easy to get at.

You should not try to determine which speaker wire goes to +5 volts, and which goes to the collector of the transistor. On a PC, two of the four connector pins may be connected together; these are both +5. Going back to the speaker for a moment, unsolder the wire that goes to the transistor collector, and leave connected the one that goes to +5 volts.

If you're installing a volume control, connect the wire you just unsoldered to one side of the switch. Connect another piece of wire to the other side of the switch, and then temporarily bridge a 100 ohm resistor across the two connections (you may have to change the resistor later). A 330 ohm resistor will be about right for a Microbee. You may find that your switch has three connections; if this is the case use the centre connection and one of the outer ones.

The free end of the second wire should now be connected to your 3.5mm socket, to the connection that mates with the metal tip of the matching plug. You may have to temporarily insert the plug and do some snooping with an ohmmeter to find the right connection. Next go back to the speaker and add yet another piece of wire to the connection that was previously left intact (the one that goes to +5). The other end of this wire connects to the 3.5mm socket, to the connection that mates with the metal sleeve of the matching speaker plug. The sleeve is the main barrel of the plug, that has the tip at the end.

Finally one wire to go. Pull the plug out of the socket now, and verify with an ohmmeter that the wire going back to the switch now connects through to the third connector on the speaker socket. Solder a wire from this connection to the connector on the internal speaker from which you removed the first wire. The idea is to let the external speaker plug intercept the speaker signal when it is plugged in, but to cut the signal through to the internal speaker when no external plug is connected.

External speaker

THE BASIC IDEA of a speaker external to the computer is to provide a larger speaker (for better bass note reproduction), coupled with a decent size box (for best acoustic efficiency – that is, the most noise per watt). As a general rule, the bigger the speaker, and the bigger the box, the bigger the sound. This isn't really correct hi-fi design, it's better described as the Juke Box Principle. So how do we turn a computer into a juke box?

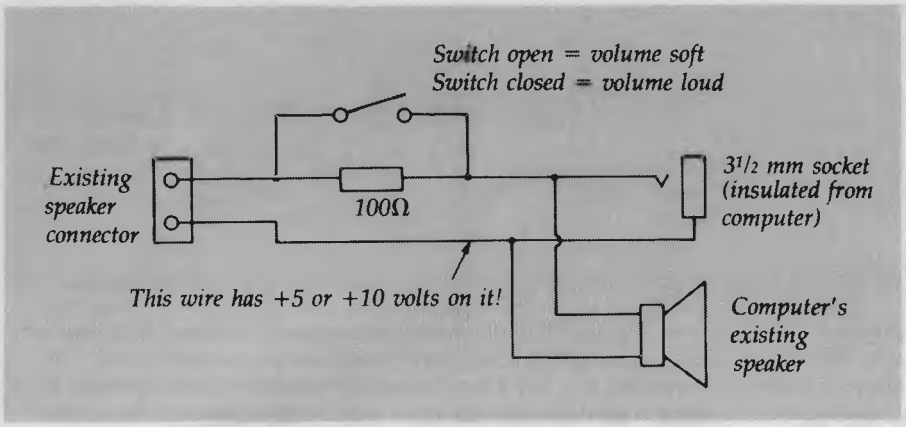


Figure 2. The wiring for an external speaker and volume switch. The volume control is implemented with one resistor and a switch.

You can go out and buy an 'extension speaker', consisting of a timber or plastic box, a speaker, and a lead with a 3.5mm plug already soldered on the end. Try to get a speaker rated '8 ohms' or higher to avoid overloading the transistor in the computer. Such a speaker can also be useful for other things. If you really want to frazzle your brain, you can use a pair of headphones instead of a speaker. *Ooohh!* It hurts my ears to even think about that! Seriously though, this modification can put out enough steam to permanently damage your hearing if you use headphones. Perhaps a safety measure would be to install an extra resistor of 470 ohms or so between the speaker socket and the headphones. Test them at a distance first. Beware please!

I solved the external speaker problem with the usual Moffat style and elegance. I had on hand an oval-shaped speaker that had been salvaged from some old radio. This was carefully mounted in a special cardboard enclosure marked Blue Banner Brand Onion Pickles, 24 Bottles. An oval shaped hole was cut in the box and the speaker was mounted behind the hole with four rusty machine screws. The box is held together with various bits of sticky tape, and the wire protrudes out one corner. The completed structure measures around 30cm on each side, and was originally designed for use with an AM/FM radio which had seen better days. It sounds really great plugged into the computer!

A stereo amplifier adapter

THIS LITTLE circuit, shown in Figure 3, lets you substitute a 200 watt stereo system for the external speaker. If you don't like your neighbors, now's the time to let them know. Be prepared for police action, and don't go near any dogs. Audio weapons like this were used during the Second World War to disorient the enemy; now you can have one in your very own lounge room.

Remember that we are still working with square waves, on/off states generated by the switching transistor. A computer's beeper depends on the very sloppiness of a low quality speaker to smooth over the violent high-to-low and low-to-high signal transitions. So what you hear on a small speaker is an attempt at a pure tone. What comes out of a high quality stereo system is a highly amplified, variable frequency, buzz saw.

This brings to mind one Microbee game my son likes to play, called Meteor Rescue. This game produces the most disgusting, painful, unattractive noises ever heard on a Microbee speaker. Imagine these screeches, squawks, squeaks, and scratching noises, faithfully reproduced on a big stereo system. Here's how to do it – there are three basic parts: a load, DC isolation, and a voltage divider. You can build this up on a scrap of Vero-board, or haywire it all together and wrap it up in tape. Just don't bring it anywhere near me!

Now, at the left of Figure 3 is a 3.5mm plug to mate with your external speaker socket. Wired across the plug is a 22 ohm resistor; this is a 'load' to take the place of an external speaker. It must be in the circuit for the transistor to work. Next come two 0.1uF capacitors, one in each wire going toward the stereo amplifier. The capacitors will pass audio signals, but block the passage of direct current. They are there to keep the computer's +5 volt DC supply from getting into the amplifier.

The audio then goes through a 1000 ohm resistor, to the top of a 100 ohm resistor, which is across the input to the stereo amplifier. These resistors act to divide the audio voltage by a factor of 100 (10000/100), before it goes into the stereo amplifier. Assuming a signal swing of 5 volts, which is a reasonable level to feed into its tuner or auxiliary input.

There are two outputs of this circuit, one for each channel. The circuit simply straps the two channels together so they both get the same signal from the computer. By the way, this circuit would also be useful for connecting something like a small radio, cassette recorder, or shortwave set to a stereo amplifier. That way you can serenade your neighbors with Radio Moscow if they get tired of computer noises.

Flippin' the bits

HERE IS A SHORT discussion of how to produce noises with your computer, and believe me, it's going to be short. Whole books have been written on this subject, so we will restrict ourselves to bare basics – just enough to get the idea.

In the IBM PC, the basic source of speaker sound is the 8253 timer chip which was covered in the June '89 issue of *YC*, so we won't repeat it here. The speaker output is also under the control of Bit 1 of Output port 61 (hexadecimal), as discussed in that article. If you set the bit high, it sends the square wave from the timer chip through to the speaker. If you set the bit low, it blocks the square wave. If you send another square wave, generated in software, to Bit 1, it will combine with the square wave already coming from the timber chip to produce a speaker output consisting of both square waves mixed. This is the basis of complex sound effects on the PC.

On the Microbee you produce a tone in the speaker by sending a software generated square wave to Bit 6 of Port 2.

Ready-made software

THERE ARE MANY programs around that will make music on computers. It seems that every collection of Turbo Pascal files contains some little routine to play a tune on the computer's speaker. There are lots of Public Domain music programs floating around on the bulletin boards, but from

what I can see, one stands out above all the others.

First, some background: even since I was a kid, back in the USA, I've been fascinated by mechanical music makers. There were, and still are, lots of touristy places with fine collections of these lovely relics. The best of them would combine a piano, violin, mandolin, drums, bells and whistles, all driven by a paper roll arrangement as in a pianola. You put your five cents in a slot, stood back, and the machine would put on a performance guaranteed to amaze and astound.

The very, very best of these machines was in a little town high up in the Colorado Rocky Mountains. Its *piece de resistance* was a stirring rendition of Scott Joplin's 'Maple Leaf Rag'. When you put your money in it would snort loudly, thump its drum, the piano would hit a couple of bass notes, and then the violin, mandolin, and the whole works would start up together, all playing in harmony.

The machine really blew my brains out. I just couldn't keep away from it, and I spent many long hours feeding my hardearned pocket money into it. A bit like today's video arcades, I suppose. This miserable addiction continued into adulthood, and today my family suffers the presence of a gigantic harmonium wind organ, again driven by paper rolls. The machine is well over 100 years old, and allegedly misspent its youth entertaining the patrons in a brothel in Bendigo.

This wind organ emits some convincing huffing and puffing, and when you open the shutters and let it go into full cry, the machine shakes the walls and stops by standers dead in their tracks. It does a pretty fair imitation of a horror movie soundtrack with the 'Flying Dutchman Overture', but the tune that really gets them in is one called 'American Beauty Two-Step', which sound remarkably like the theme from Monty Python's Flying Circus.

I mention these matters to introduce a Public Domain MS-Dos program called Pianoman. This thing has to be the modern equivalent of those old time music machines. It uses a disk file instead of a paper roll, but the result is the same: mechanically generated music. What's more, you can program the 'rolls' yourself so it can play any tune you want, in four voices at once.

Pianoman was the reason for this speaker upgrade project; the music sounded pretty wishy-washy playing through the IBM's internal speaker. But with the Pickle Box connected, it's got enough kick behind it to bring irate shouts of 'Shut That Bloody Thing Off!' from other parts of the house – in other words, it works very well. One of the pre-programmed tunes that comes with Pianoman is the full and original version of Maple Leaf Rag. the first time I ran it, all I could hear was that old music machine from my childhood. Hooked, I was, all over again. And another of Pianoman's talents is the complete version of the Monty Python Flying Circus theme.

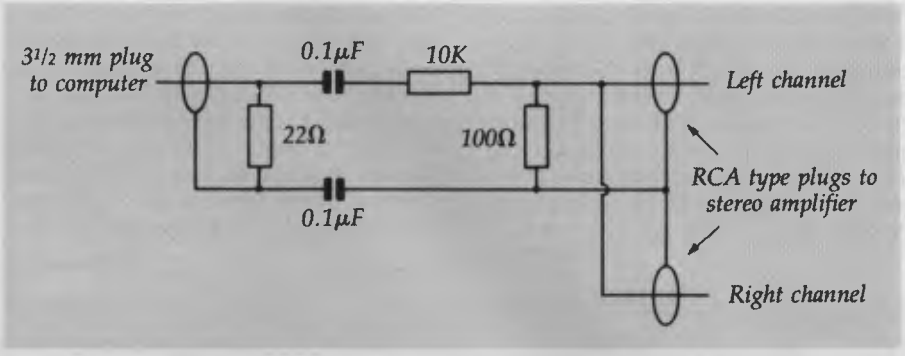


Figure 3. *A circuit to connect computer audio to stereo amplifier – it lets you substitute a 200 watt stereo system for the external speaker.*

When you first fire up Pianoman, the screen will show a representation of the PCs keyboard, with most keys as signed note names. At this stage you can tap the keys and play little tunes in real time. You can make the computer record what you play and then play it back to you, much like those little keyboard synthesizers sold in department stores.

But the real power of Pianoman is in its editor, which you enter by pressing F1 while in the opening screen. Figure 4 shows you the editing screen. Each box contains pitch and length information for one note. You can play the notes into the boxes in real time from the opening screen, or enter them one by one with the editor. You can ask Pianoman to play the tune that's in the editor, and you can change the tempo and the key it's being played in. You can use WordStar-like block moves and copies to shift great chunks of music from one place to another. And, when you're finished you can save the editor's contents to a disk file and reload in later.

So far this sounds pretty ordinary, but Pianoman's shining light is the ability to play a tune made up of our different 'voices', all at once. Each voice can be entered and perfected on the editor, and then the four are combined into one music file. Actually, the voices aren't played simultaneously, but one at a time in quick rotation, a form of 'time division multiplex', if you want to put a big scientific name on it. The program gives you a burst of voice 1, then voice 2, then 3, then 4 and back to voice 1. This happens very fast, so the effect is of all voices playing at once. Sometimes you can detect a kind of 'burbing' effect, which somehow seems to add to the charm of the music. (Charm? Well, that might be a bit much . . .)

It seems the most accurate way to program a tune into Pianoman would be to work from the sheet music, planning in advance which note will belong to which voices. The Maple Leaf Rag sample that comes with Pianoman has each of the four voices in separate files, as well as all the voices combined. Figure 4 shows the fourth voice, which appears to be the main bass line, sitting in the editor.

If you make the editor play voice 4 on its own, it sounds like it is playing the very bottom line of notes in the sheet music for Maple Leaf Rag. Similarly, voice 3 seems to be the top notes of the bass clef. Voices 2 and 1 would then be the high and low parts of the treble clef. I don't read music so I can't guarantee these observations.

Pianoman has a utility to convert your finished tune into a COM, file which will cause the tune to be played when you type its name from the Dos command line. In other words, independently of the Pianoman program. As each tune is playing, it displays a small sign on the screen with the tune's name or any other comments you may like to add.

Several tunes can be combined into a

BAT file to produce a whole concert; this is what is done in PLAY.BAT. It's the audio equivalent of one of those 'Slide Show' programs that display a series of pictures. You could, of course, include an appropriately insulting tune in an AUTOEXEC.BAT file, complete with matching screen message, as a little trap for an unsuspecting PC user.

As you can see, I'm pretty rapt in Pianoman, although there will be those like my family, who think the whole idea is silly. Perhaps it would be more popular if I could teach it some John Farnham songs. Pianoman is one of those programs that certainly qualifies as first-quality. I can't understand how it ended up as Public Domain instead of finding a commercial market. It's one of those programs that's just naturally good, having no other purpose in life than to make people happy. □

If you'd like a copy of Pianoman, send a note to Piano, Your Computer, PO Box 227, Waterloo 2015 NSW and enclose $4 (no cash, please), or check your local Opus bulletin board.

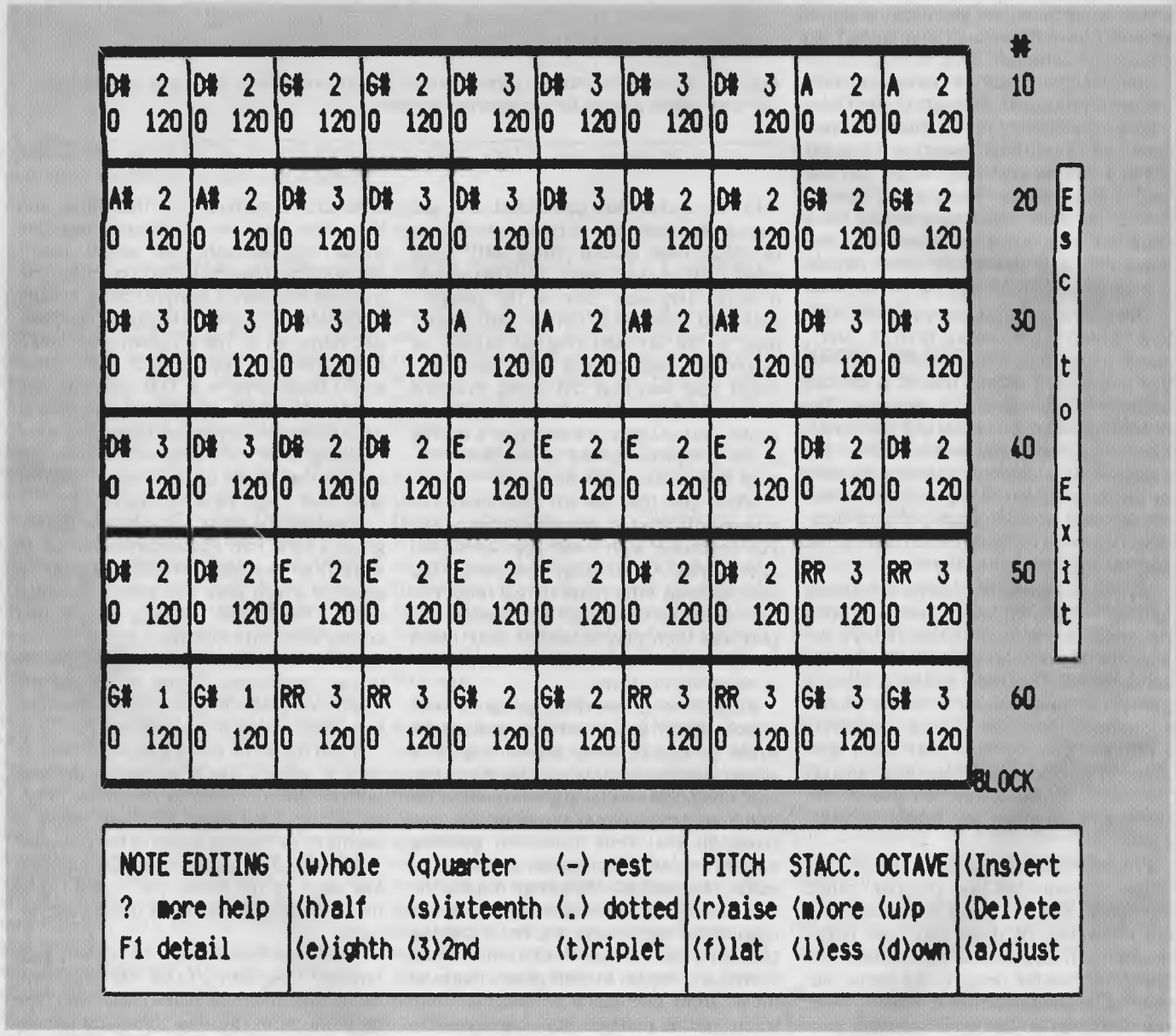


Figure 4. *The real power of Pianoman is in its editor, which you enter by pressing F1 while in the opening screen – the editing screen is shown here. Each box contains pitch and length information for one note, and you can play the notes into the boxes in real time from the opening screen, or enter them one by one with the editor. Pianoman can play the tune that's in the editor, and you can change the tempo and the key it's being played in. You can use WordStar-like block moves and copies to shift great chunks of music from one place to another. And, when you're finished you can save the editor's contents to a disk file and reload in later.*

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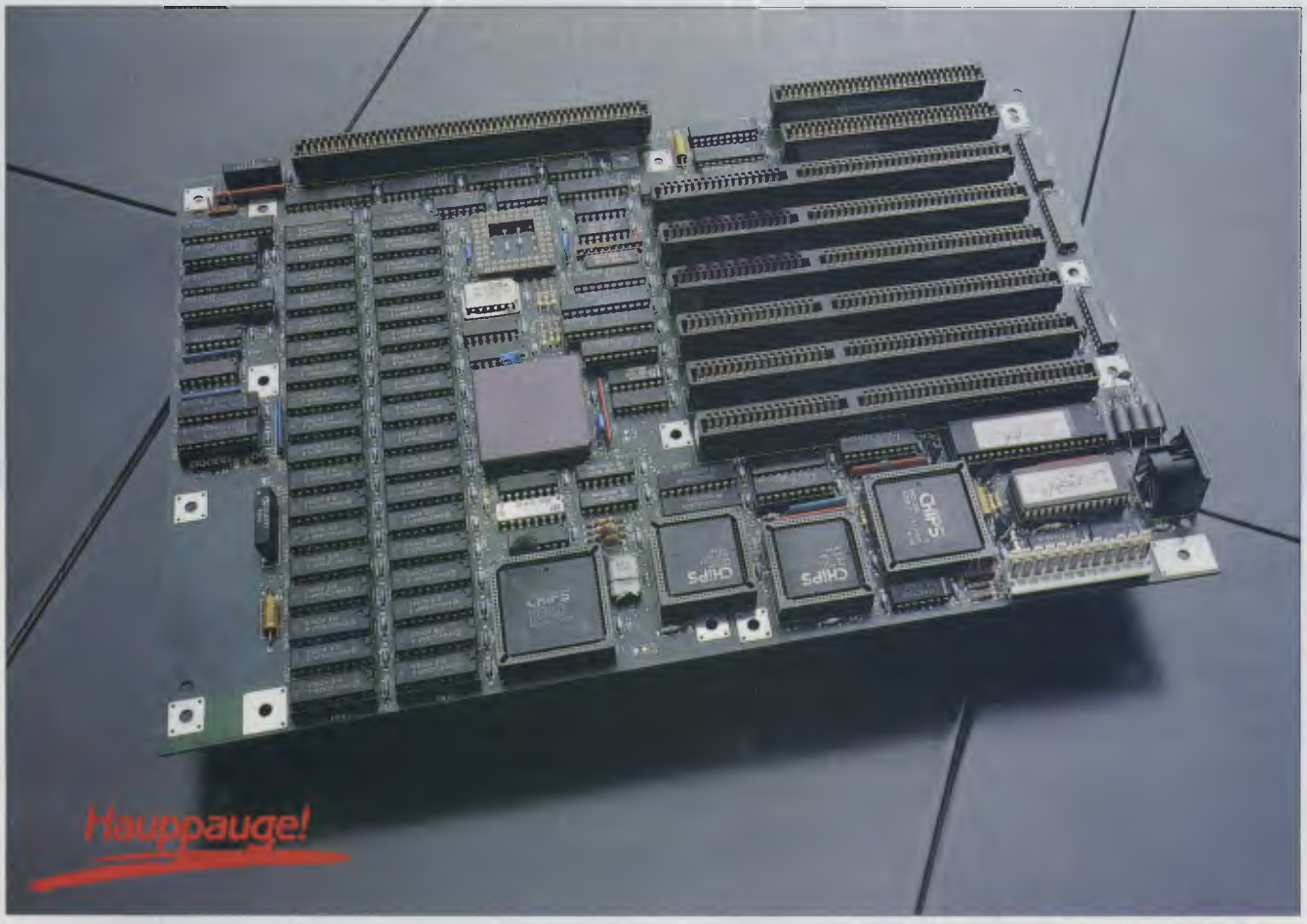

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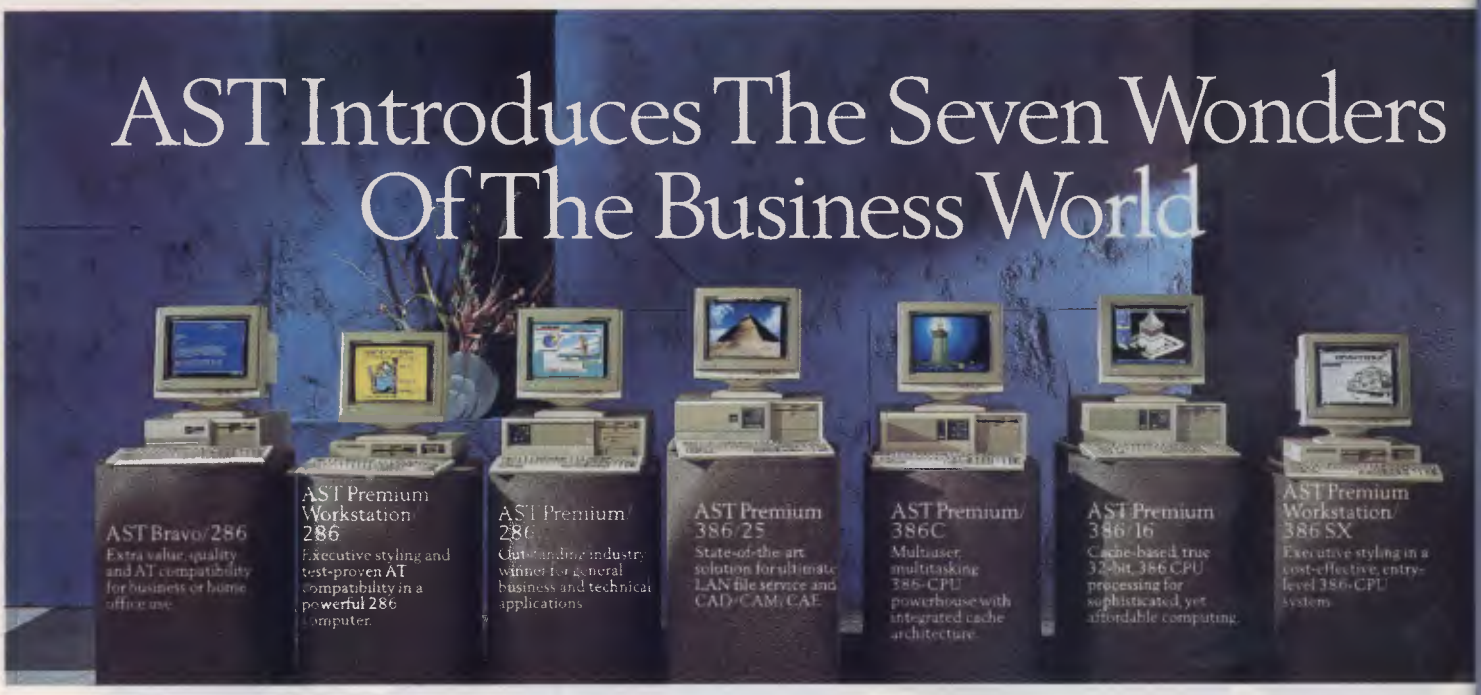

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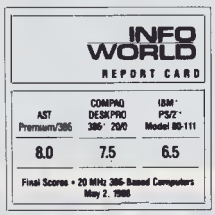

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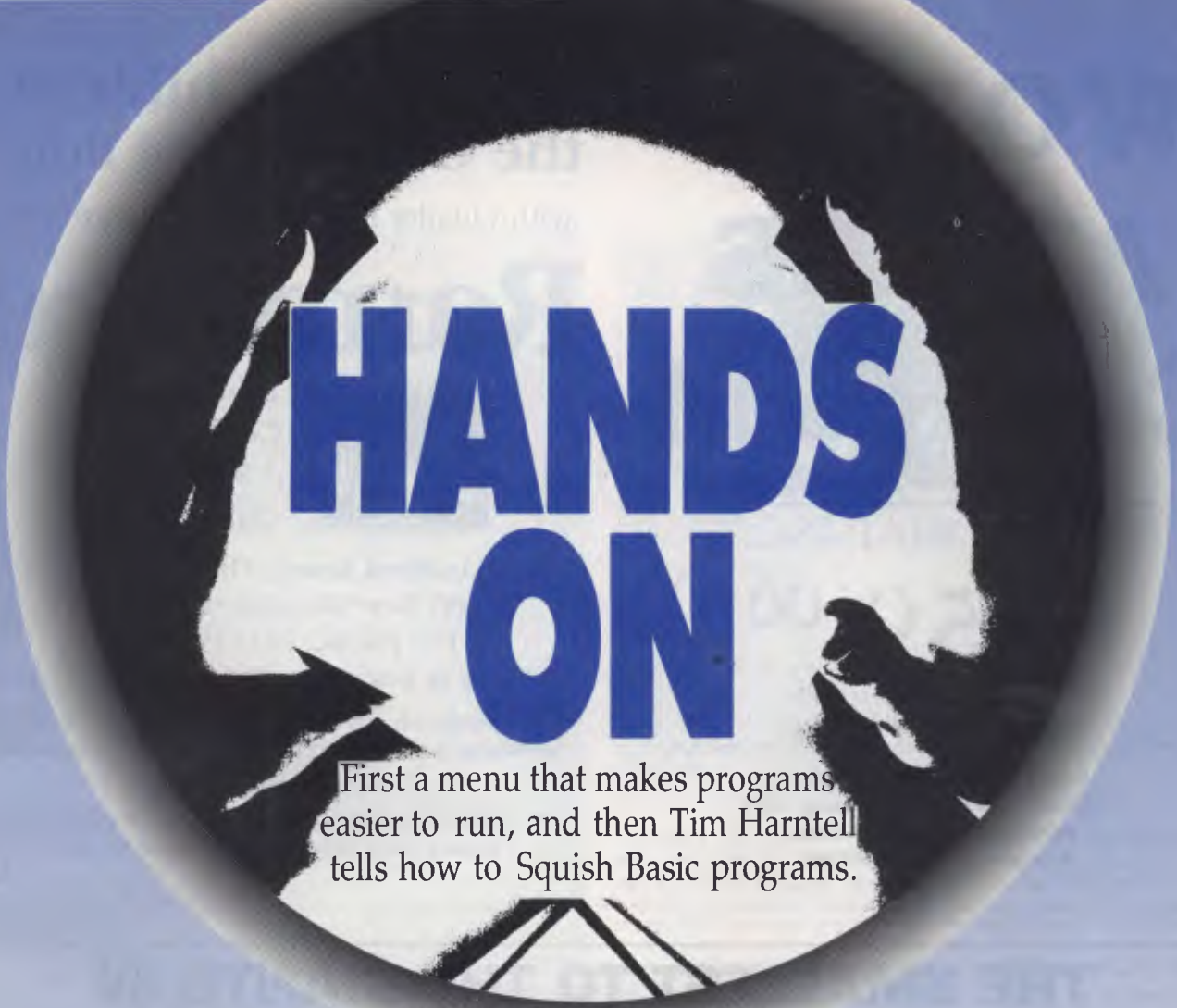


HANDS ON

First a menu that makes programs easier to run, and then Tim Harntell tells how to Squish Basic programs.

IN THIS SERIES, we explore a number of worthwhile utility programs from the public domain which you can run on your IBM-compatible PC under GW-Basic or BasicA. Entering and running the programs has two benefits. Firstly, you end up with a demonstration or utility program which is worthwhile in itself. Secondly, studying the listing – with the aid of the article – and attempting to understand the program logic, may well be of some help to you in developing better programming skills.

This month we'll create a general purpose menu program which you can modify to place on your disks to make it simpler to run the programs of your choice. A number of programming ideas are also used which you may find of benefit in other programs.

We will also take a look at Squisher, which is designed to 'compress' Basic programs so they take up less room on your disks. It is ideal to use before compiling a program, as the final compiled code will be as compact as possible. A squished Basic program will be up to 40 per cent shorter than the original program.

Menus

BUT FIRST TO menu. With this program, you just alter the menu title line, and insert your menu entries, and Menumaker will do the rest. Up to 64 menu entries can be displayed (if you have the space) in one to four variable width columns.

Once you have the program up and running on your computer as listed here, make the following changes. Put the title of your disk in line 60 in place of the words 'your menu title goes here'. Each menu entry is a data statement consisting of a pair of character strings enclosed in quotes. The first string of each pair names the program to be run and the second string is a short description – which will be shown on screen – of the program. You place your DATA statements in lines 80 through to 100, using the intermediate line numbers (81, 82 and so on) to fit in all the entries you want.

Now we'll look at lines 140 and 150. In line 140, LINENUM is the number of bytes occupied by each entry number prompt, and MAXENTRIES is the maximum number of possible menu entries. MAXCOL is the maximum possible number of columns of entries, while MAXROW, obviously enough, is the maximum number of possible rows of entries. MINGAP is the smallest number of possible spaces between columns. Line 150 dimensions a number of arrays. N$(MAXENTRIES) is for the table of program names, T$(MAXENTRIES) for the table of program text descriptions, BEG(MAXCOL) is the beginning screen position for each column and WID(MAXCOL) the width of text for each column.

Lines 170 through to 210 display the menu title block, and lines 230 through to 260 store the menu data. Next the program calculates the screen format, with lines 280 through to 520. Line 300 works out the number of columns as number of entries divided by the value MAXROW, and 310 works out the width of each row, which is saved as WID(COL) in the loop from 320 through to 390.

Gap size

IN LINE 400, the program determines the gap size as MAX(3,(SCREENWIDTH-DATAWIDTH)/(COL+1)) and works out the overall data width in line 410, assigning this to the variable DATASIZ. If DATASIZ plus the required space between columns, DATAZIS+GAP*(COL+1), is found to be greater than 80 (line 420) then the program will report to you that the menu you're trying to create is too big for the screen, and end the run.

Lines 460 through to 500 determine the column starting loca-

```
10 '               MENUMAKER
20 '         HANDS ON' - Your Computer
30 'Public domain program by Ken Mackenzie, Greendale,
40 '     Wisconsin, modified by Tim Hartnell
50 ' --------------------------
60     TITLE$="your menu title goes here"
70 ' --------------------------
80 DATA "FRSTPROG", "First program's descriptive text"
90 DATA "PROGRAM2", "Second program's descriptive text"
100 DATA "  etc. ", "   and so forth   "
110 ' --------------------------
120 DATA "END"     ,"end"
130 ' --------------------------
140 LINENUM=5:MAXENTRIES=65:MAXCOL=4:MAXROW=18:MINGAP=1
150 DIM N$(MAXENTRIES),T$(MAXENTRIES),BEG(MAXCOL),WID(MAXCOL)
160 ' --------------------------
170 DEF SEG: POKE 106,0: KEY OFF: SCREEN 0,0: COLOR 7,0,0: CLS
180 PRINT CHR$(201) STRING$(77,205) CHR$(187)
190 PRINT CHR$(186) TAB(41-LEN(TITLE$)/2) TITLE$ TAB(79)
CHR$(186)
200 PRINT CHR$(200) STRING$(77,205) CHR$(188)
210 PRINT
220 ' --------------------------
230 FOR E = 1 TO MAXENTRIES
240   READ N$(E),T$(E)
250   IF N$(E)="END" THEN 270
260 NEXT E
270 ' --------------------------
280 ENTRIES=E-1
290 ' --------------------------
300 COL=INT((ENTRIES+MAXROW-1)/MAXROW)
310 ROW=INT((ENTRIES+COL-1)/COL)
320 FOR C=1 TO COL
330   WID(C)=0
340   FOR R=1 TO ROW
350     INDEX=R+MAXROW*(C-1)
360     L=LEN(T$(INDEX))
370     IF L>WID(C) THEN WID(C)=L
380   NEXT R
390 NEXT C
400 DATASIZ=0
410 FOR C=1 TO COL: DATASIZ=DATASIZ+WID(C)+LINENUM: NEXT C
420 IF DATASIZ+GAP*(COL+1)>80 THEN PRINT "Menu is too big for the
screen.":STOP
430 GAP=INT((80-DATASIZ)/(COL+1))
440 IF GAP<MINGAP THEN GAP=MINGAP
450 ' --------------------------
460 NEXTCOL=81-GAP
470 FOR C=COL TO 1 STEP -1
480   BEG(C)=NEXTCOL-WID(C)-LINENUM
490   NEXTCOL=BEG(C)-GAP
500 NEXT C
510 ' --------------------------
520 BEGLINE=5+INT((MAXROW-ROW)/2)
530 ' --------------------------
540 FOR INDEX=1 TO ENTRIES
550   C=INT((INDEX-1)/ROW)+1
560   R=INDEX-ROW*(C-1)
570   LOCATE BEGLINE+R-1,BEG(C),0
580   PRINT USING "##";INDEX;
590   PRINT " - ";T$(INDEX)
600 NEXT INDEX
610 ' --------------------------
620 LOCATE 24,1: PRINT; "What selection number would you like ?
";
630 NUM=0
640 FOR X=0 TO 1
650   LOCATE 24,40+X,1
660   A$=INKEY$: IF A$="" THEN 660
670   IF ASC(A$)=13 THEN 720 ELSE PRINT A$;
680   A=INT(VAL(A$))
690   NUM=10*NUM+A
700   IF 10*NUM>ENTRIES THEN 720
710 NEXT X
720 IF NUM>0 AND NUM<=ENTRIES THEN CLS: CHAIN N$(NUM)
730 ' --------------------------
740 BEEP: LOCATE 24,45: PRINT  "Pardon me?";
750 FOR P=1 TO 999: NEXT P: LOCATE 24,42: PRINT SPC(19): GOTO 620
760 END
```

***Listing 1.** Menumaker – just alter the menu title line, and insert your menu entries, and the program does the rest. Up to 64 menu entries can be displayed in one to four variable width columns.*

tions and line 520 works out the row starting line. Finally, after all this (which happens much faster than reading this description takes), your selections are displayed with the little block of code from lines 540 through to 600.

The user's input is then accepted with the section of the program from 620 through to 710, and line 720 transfers control to the program of your choice. If you make a mistake in this section, like requesting a program number which is not on the menu, the error section (lines 740 through to 760) will be activated, before control is return to the start of the input section at line 620.

Squisher

NOW LET'S look at Squisher. Even for programs which you leave in Basic, you may find they run a little quicker in the compressed version than the original. This, however, really depends on the program itself. Note that the squished program is often much harder to read and follow than the unsquished version, so you should only squish a program once you have finished working on it.

To use Squisher, you save your original program as an ASCII file (which you do by saving it as usual, except that you follow the file name with ,a so that it reads SAVE 'FILENAME',A). Then, when you run Squisher itself, the following dialogue will be seen –

```
ENTER THE NAME OF THE PROGRAM TO BE SQUISHED: original.bas
ENTER THE NAME FOR THE FINAL SQUISHED PROGRAM: squeezed.bas
WOULD YOU LIKE EXTRA SPACES DELETED? (Y/N) y
WOULD YOU LIKE REM STATEMENTS DELETED? (Y/N) y
WOULD YOU LIKE TO COMBINE LINES? (Y/N) y
WOULD YOU LIKE TO PROTECT ANY LINES? (Y/N) n
```

– then you just sit back and watch the program do its work. It can take a long time to compress a major program, so set it up before you take a coffee break and let it get on with the job. While Squisher is doing its compression, it will give a report to you on its progress, like this –

```
SCANNING LINE: 340
340 PRINT:PRINT:PRINT TAB(4);'TOTAL';AT
SCANNING POSITION: 12
NUMBER OF LINES COMBINED: 79
NUMBER OF SPACES DELETED: 18
NUM8ER OF REM STATEMENTS DELETED: 25
```

To show you how it works, here are the first ten lines of one program I compressed, as they originally appeared –

```
10 REM HOME RUN!
20 CLS
30 RANDOMIZE VAL(RIGHT$(TIME$,2))
40 DIM a(10),B(10<Z(10)
50 S=0:B=0:0X=0
60 FB=0:SB=0:TB=0
70 REM **********************
80 PRINT:PRINT:PRINT
90 INPUT "ONE PLAYER OR TWO";X
100 IF X<1 OR X>2 THEN 90
```

After Squisher had done its work, these were cut down to two lines as follows –

```
20 CLS:RANDOMIZE VAL(RIGHT$(TIME$,2)):DIM
A(10),B(10),Z(10):S=0:B=0:0X=0:FB=0:SB=0:TB=0:PRINT:PRINT:PRINT
90 INPUT"ONE PLAYER OR TWO";X:IF X<1 OR X>2 THEN 90
```

Once the scanning is over, you'll be told –

```
PRESS 'L' TO LOAD THE SQUISHED PROGRAM
```

Then you just run the compressed version as normal.

It is quite interesting to compare the size of the original file with its compressed version. The program above started life 5449 bytes long, and after compression was 4376 – that's about 80 per cent of its original size. □

```
10 '            SQUISHER
20 '   'HANDS ON' - Your Computer
30 '   Compresses Basic programs.
40 ' They must be saved as ASCII files
50 DEF
FNI$(A$)=CHR$(ASC(LEFT$(A$,1))+32*(LEFT$(A$,1)>"Z")):DEFINT
B-K,S-Z:A=0:AZ=0:A$="":C$="":D=0:DS=100:DT=0:G1=0:G2=0:G3=0:G4=0:
  G5=0:G6=0:HH=0:I$="":IP$="":J$="":LN=0:L$="":L1$="":N$="":P=0:
  PJ=0:PP=0:PV=0:Q$="":R=0:RD=0:RE=0:S=0:S1=0
60 SD=0:SQ$="":SV$="":T=0:T1=0:T2=0:V$="":X=0:XC$="":XS$="":XP$=
"":ZC=0:DIM REF(DS*2),PRO(DS):SCREEN 0,0,0:WIDTH 80:COLOR 11,0:KEY
OFF:CLS:LINE INPUT"ENTER THE NAME OF THE PROGRAM TO BE SQUISHED:
";SQ$ 70 XS$="N":IP$="N":XC$="N":XP$="N":PRINT:LINE INPUT"ENTER THE
NAME FOR THE FINAL SQUISHED PROGRAM: ";SV$:PRINT:LINE INPUT"WOULD
YOU LIKE EXTRA SPACES DELETED? (Y/N) ";XS$:IF XS$="" THEN XS$="N"
80 IF XS$="y" THEN XS$="Y"
90 PRINT:LINE INPUT"WOULD YOU LIKE REM STATEMENTS DELETED? (Y/N)
";IP$:IF IP$="" THEN IP$="N"
100 IF IP$="y" THEN IP$="Y"
110 PRINT:LINE INPUT"WOULD YOU LIKE TO COMBINE LINES? (Y/N)
";XC$:IF XC$="" THEN XC$="N"
120 IF XC$="y" THEN XC$="Y"
130 PRINT:LINE INPUT"WOULD YOU LIKE TO PROTECT ANY LINES? (Y/N)
";XP$:IF XP$="" THEN XP$="N"
140 IF XP$ = "y" THEN XP$ = "Y"
150 ON ERROR GOTO
640:XS$=FNI$(XS$):IP$=FNI$(IP$):XC$=FNI$(XC$):XP$=FNI$(XP$)
160 IF XS$="N" AND IP$="N" AND XC$="N" AND XP$="N" THEN RUN
170 IF XP$="Y" THEN INPUT"ENTER LINE NUMBER TO PROTECT (0 TO
EXIT) ";PRO(PV):IF PRO(PV)>0 AND PV<DS THEN PV=PV+1:GOTO 170
180 OPEN SQ$ FOR INPUT AS #1
190 IF EOF(1) THEN 320
200 LINE INPUT #1,A$:IF ASC(A$)>58 THEN COLOR
12,0:PRINT:PRINT"**** '";SQ$;"' IS NOT AN ASCII FILE
****":PRINT:COLOR 11,0:END
210 G1=1:G2=1:G3=1:G4=1:G5=1:G6=1
220 D=4:T=INSTR(G1,A$,"THEN"):IF T THEN G1=T+D:GOTO 290
230 T=INSTR(G2,A$,"GOTO"):IF T THEN G2=T+D:GOTO 290
240 T=INSTR(G3,A$,"ELSE"):IF T THEN G3=T+D:GOTO 290
250 T=INSTR(G4,A$,"GOSUB"):IF T THEN D=5:G4=T+D:GOTO 290
260 T=INSTR(G5,A$,"RESUME"):IF T THEN D=6:G5=T+D:GOTO 290
270 T=INSTR(G6,A$,"RUN"):IF T THEN D=3:G6=T+D:GOTO 290
280 GOTO 190
290 A=VAL(MID$(A$,T+D)):IF A THEN FOR HH=1 TO R:IF REF(HH)<>A
THEN NEXT:R=R+1:REF(R)=A
300 IF A>0 THEN
T=T+D:D=1:T1=INSTR(T,A$,","):T2=INSTR(T,A$,":"):IF T1>0 AND (T2=0
OR T1<T2) THEN T=T1:GOTO 290
310 GOTO 220
320 CLOSE:FOR S=1 TO R:FOR S1=S TO R:IF REF(S)<REF(S1) THEN SWAP
REF(S),REF(S1)
330 NEXT S1,S:FOR S=0 TO PV:FOR S1=S TO PV:IF PRO(S)>PRO(S1) THEN
SWAP PRO(S),PRO(S1)
340 NEXT S1,S:OPEN SQ$ FOR INPUT AS #1:OPEN SV$ FOR OUTPUT AS
#2:CLS
350 IF EOF(1) THEN 460
360 LINE INPUT #1,A$:FOR HH=INSTR(A$," ") TO LEN(A$)-1:IF
MID$(A$,HH+1,1)=" " THEN NEXT
370 PP=HH:X=PP:LN=VAL(A$):LOCATE 1,1:COLOR 11,0:PRINT"SCANNING
LINE:";:COLOR 12,0:PRINT LN:PRINT:PRINT STRING$(255,32):LOCATE
3,1:COLOR 14,0:PRINT A$:LOCATE 8,1:COLOR 11,0:PRINT"SCANNING
POSITION:    ":PRINT
380 PRINT"NUMBER OF LINES COMBINED:";:COLOR 12,0:PRINT RE:COLOR
11,0:PRINT:PRINT"NUMBER OF SPACES DELETED:";:COLOR 12,0:PRINT
SD:COLOR 11,0:PRINT:PRINT"NUMBER OF REM STATEMENTS
DELETED:";:COLOR 12,0:PRINT RD:COLOR 11,0:GOTO 490
```

```
390 IF XC$()"Y" THEN PRINT #2,A$:GOTO 350
400 IF C$="" THEN C$=A$:GOTO 350
410 IF R)0 THEN IF LN=REF(R) THEN R=R-1:GOTO 450 ELSE IF
LN)REF(R) THEN R=R-1:GOTO 410
420 IF INSTR(C$,"IF") OR INSTR(C$,"RETURN") THEN 450
430 V$=RIGHT$(A$,LEN(A$)-X):IF LEN(C$)+LEN(V$)(240 THEN
C$=C$+":"+V$:RE=RE+1 ELSE 450
440 GOTO 350
450 PRINT #2,C$:C$=A$:GOTO 350
460 PRINT #2,C$:CLOSE:COLOR 12,0:LOCATE 8,19:PRINT T:LOCATE
10,26:PRINT RE:LOCATE 12,26:PRINT SD:LOCATE 14,34:PRINT RD
470 LOCATE 3,1:PRINT STRING$(255,32):LOCATE 3,1:COLOR
14,0:PRINT"PRESS 'L' TO LOAD THE SQUISHED PROGRAM":SOUND
1000,6:SOUND 660,5:COLOR 11,0
480 Q$=INKEY$:IF Q$="" THEN 480 ELSE CLS:IF Q$="L" OR Q$ = "l"
THEN LOAD SV$ ELSE END
490 N$=LEFT$(A$,PP):ZC=160+PP:PP=PP+1:P=0:J$="":DT=0:FOR T=PP TO
LEN(A$):L$=MID$(A$,T,1):AZ=INT(ZC/80):LOCATE AZ+1,ZC-
AZ*80+1:COLOR 10,0:PRINT MID$(A$,T,1);:ZC=ZC+1:COLOR 12,0:LOCATE
8,19:PRINT T
500 COLOR 11,0:IF L$=CHR$(34) THEN IF P THEN P=0 ELSE P=1
510 IF P THEN 600
520 IF MID$(A$,T,4)="DATA" THEN DT=1 ELSE IF L$=":" THEN DT=0
530 IF DT THEN 600
540 IF L$()" " OR XS$()"Y" THEN 580 ELSE IF J$)"" THEN
L1$=RIGHT$(J$,1):IF L1$="" OR (L1$)")" AND L1$("0") OR (L1$)"9"
AND L1$("A") THEN L$=""
550 L1$="X":IF T(LEN(A$) THEN L1$=MID$(A$,T+1,1)
560 IF L1$="" OR L1$=CHR$(34) OR L1$=" " OR (L1$)")" AND
L1$("0") OR (L1$)"9" AND L1$("A") THEN L$=""
570 IF L$="" THEN SD=SD+1
580 IF PV)PJ THEN IF LN=PRO(PJ) THEN PJ=PJ+1:GOTO 620 ELSE IF
LN)PRO(PJ) THEN PJ=PJ+1
590 IF MID$(A$,T-1,5)=" REM " OR L$="'" THEN IF IP$()"Y" THEN
A$=N$+J$+MID$(A$,T,255):GOTO 620 ELSE RD=RD+1:IF LN=REF(R) THEN
R=R-1:A$=N$+J$+"'":GOTO 620 ELSE IF J$="" THEN 350 ELSE 610
600 J$=J$+L$:NEXT:IF P THEN J$=J$+CHR$(34)
610 A$=N$+J$:GOTO 390
620 IF C$()"" THEN PRINT #2,C$:C$=""
630 PRINT #2,A$:GOTO 350
640 IF ERR=53 THEN RUN ELSE ON ERROR GOTO 0
```

Listing 2. Although it depends on the program, Squished versions usually run quicker in the compressed version than the original. Note that the squished program is often much harder to read and follow than the unsquished version, so you should only squish a program once you have finished working on it. To use Squisher, you save your original program as an ASCII file (which you do by saving it as usual, except that you follow the file name with ,a so that it reads SAVE 'FILENAME',A).

MENU SIR?

Here's fast menu service from Turbo Pascal, cooked up by Gary Jacobson.

THERE MUST BE as many methods of implementing screen menus in Turbo Pascal as there are Pascal programmers. The traditional technique is based on the use of a text file to contain the items of the menu. So, although no data or code segment memory is used, we would be tied to the slowness of the disk. It should be possible to put the items we require into a data segment (if they are not too large), or in the Heap memory with very little overhead, and an increase in speed.

Furthermore, if we avoid an array structure when storing the menu items, and use a simple string constant, then there will be a slight memory saving. It will be necessary to perform some rudimentary parsing of this string constant, but that is more than sufficiently speedy for this purpose. Also, if we can manage to calculate as many variable values internally to a MenuSetUp procedure as reasonably possible, it will reduce our parameter passing problems a little and also eliminate a small amount of stack usage. In Listing 1, I have outlined a simple technique, in which a string constant is parsed to give the number of menu items, and the menu is popped up on the screen at any position determined by the upper left-hand co-ordinates passed to the procedure. Let's take it from the top!

Firstly the Uses statement has CRT (a standard unit), and a user defined unit of my own, called Windows. A stunningly original name!

Windows contains screen saving and restoring procedures, plus a selection of framing procedures. The procedures thus implemented are by means of pointers as outlined in 'Wide Open Windows' in the September 1989 issue of *Your Computer*. Without Windows.TPU, or something similar on your own disk, the current procedures will not function as explicitly outlined here. Tough biscuits for those who have pirated Turbo 5.0 and don't know how to set up a unit.

The constants MS1, MS2 and MS3 are only declared so that I can accommodate the column width restrictions of the magazine. They are concatenated to make the one larger string constant MenuString1. Normally, menus can be accommodated by typing a long line of items delimited by the '/' character. Since Turbo pre-evaluates such constants at compilation time, this results in no loss of speed whatsoever. By the way, I chose '/' as a delimiter because it is easy to read the strings and the slash is not a common punctuation mark. Please yourself though. The pointers used are to facilitate the saving and restoration of the screen.

MenuSetUp

NOW, TO THE main procedure, MenuSetUp. It requires the upper left-hand corner (X1,Y1), of your menus window position as a parameter, a Header as title, and of course MenuString1 with the items of the menu in it. Text and Back are the foreground and background colors respectively,and are selected from the available list of colors. If you are working in mono, or the end users hardware is unknown, then you must either auto-detect the hardware or make it readable in two colors only. I would suggest black on light gray in this latter case.

Our first task is to lexically scan MenuString1 to count the number of items, (NumItems), and, simultaneously calculate the width of the largest item in the menu. This width will later be used to set the offset position of X2 for the Window procedure, by adding its value to X1. The variable NumItems is also essential as it enables us to find the offset of Y2 from Y1.

Hence, we have eliminated the need to pass one or two extra parameters to the procedure in the first place. This process is immediately followed by –

```
If Y1 + NumItems + 4 > 24 then
   Y1 := Y1 - ((Y1 + NumItems + 4)
                          - 24);
```

– which provides us with some protection from crashing off the bottom of the screen, in case of an unsuitable selection of X1 and Y1. It means you don't have to worry too much about Y co-ordinate values. You cannot be as lazy with X values, as no error checking is performed on these!

Next, a few lines to establish a window, and to check that Width is at least equal to 20. Why? Well, because we have some instructions at the bottom of most menus, in the form of – Use Up Down Arrows – and so on, and we don't want to squash these to smithereens if the menu items are small in width. Oh, and we add 4 to NumItems to leave some room in the vertical direction for these same instructions.

MenuSetUp final

THE FINAL PART of MenuSetUp does some elementary parsing of the string constant, and builds up each menu item, character by character, while ignoring the '/' delimiter character. It writes the item to the window and increments the line on which it writes the item, simultaneously. To tidy up, a horizontal line is drawn to separate menu items from instructions, and the instructions for use are written at the bottom of the window. No color highlighting is performed on these instructions, but you can add that quite easily, if you like.

The main program demonstration does little more than prompt the user to press Esc for the menu and will do so twice; displaying the same menu in two different positions on the screen.

The allocation and disposal of the global pointers MenuScreen1 and MenuScreen2 is used for screen storage,

```
program    Menus;

Uses       Crt,Windows;

Const
  MS1 = 'Apples/Bananas/';
  MS2 = 'Grape Fruit/Pears/Kiwi Fruit/';
  MS3 = 'Potatoes/Lemons/';
  MenuString1 = MS1 + MS2 + MS3;

Var
  MenuScreen1, MenuScreen2 : pointer;
  Ch                       : char   ;

{ Start procedure MenuSetUp }
{-----------------------------------}
procedure   MenuSetUp(X1,Y1 : integer;
            Header,MenuString : String;
                    Text,Back : word);

Var
   i,j,k            : integer;
   NumItems,Width   : integer;
   Item             : String[50];
   Ch               : Char;

Begin
  Textbackground(Back);
  TextColor(Text);
 { Calculate width of largest item }
 { and count number of items.      }
{-----------------------------------}
  Width := 0;
  k := 0;
  NumItems := 0;
   For i := 1 to Length(MenuString) do
  . begin
        If MenuString[i] = '/' then
         begin
              Inc(NumItems);
              If k > Width then
               begin
                   Width := k ;
                   k := 0;
               end
               else
                   k := 0;
            end;
          Inc(k);
      end;

 { Prevent clash with bottom of screen }
 {-----------------------------------}
  If Y1 + NumItems + 4 > 24 then
     Y1 := Y1 - ((Y1+NumItems+4) - 24);
 {-----------------------------------}
  If Width < 20 then
   Width := 20;
  Window(X1,Y1,X1+Width+2,Y1+NumItems+4);
  ClrScr;
  FrameWindow21;
  Item := '';
  GOTOXY(Width div 2 + 1 -
            length(Header) div 2,1);
  Write(Header);

  { Code to 'parse' the MenuString}
 {-----------------------------------}
 i:= 1;
 j:= 2;
 Repeat
  Repeat
    If MenuString[i] <> '/' then
       Item := Item + MenuString[i];
       Inc(i);
  Until  MenuString[i] = '/' ;

       GOTOXY(3,j);
       Write(Item);
        Item:=   ;
       Inc(j);
 Until    i >= Length(MenuString);

 GOTOXY(2,NumItems+2);
 For i := 1 to Width+1  do
  begin
       Write(#196);
  end;
 GOTOXY(1,NumItems+2);
 Write(#195);
 GOTOXY(Width+3,NumItems+2);
 Write(#180);

 GOTOXY(3,NumItems+3);
 Write('Use ',#24#25,' to select.');
 GOTOXY(3,NumItems+4);
 Write('Then press <Enter>');

 end;

{  End procedure 'MenuSetUp'          }
{-----------------------------------}

{  Begin Main program                 }
begin
     TextColor(white);
     Textbackground(Blue);
     ClrScr;
     GOTOXY(2,5);
     Write('Press ''Esc'' for menu.');
     Repeat
     Ch := ReadKey;
     Until Ch = #27;

     SaveScreen(MenuScreen1);
     MenuSetUp(10,20,' Menu ',
          MenuString1,black,lightgray);

     Window(1,1,80,25);
     Textbackground(Blue);
     TextColor(white);
     GOTOXY(50,22);
     Write('Press ''Esc''for next menu.');
     Repeat
           Ch := ReadKey;
     Until Ch = #27;
     SaveScreen(MenuScreen2);
     MenuSetUp(23,8,' Menu ',
          MenuString1,Black,LightGray);
     Window(1,1,80,25);
     Textbackground(Blue);
     TextColor(white);
     GOTOXY(50,22);
     Write('Press ''Esc'' to finish.   ');
     Repeat
           Ch := ReadKey;
     Until Ch = #27;
     RestoreScreen(MenuScreen2);
     Delay(2000);
     RestoreScreen(MenuScreen1);
     Delay(1000);
end.
```

Listing 1. *The program and procedures above, outline a fast, convenient method of displaying a menu on screen. No driver/selection code has been included at this stage.*

and after a few seconds delay, are used to slow the action to a visible pace.

In conclusion, if you like to experiment, try changing the length of MS1, MS2, or MS3, by making any of the items longer, and you will see the width of your newly created menu change accordingly. Try (X1,Y1) values which have a close proximity to the bottom of the screen, and *voila (!)* – instant pop-up type menu. Last of all, let me emphasize that there is no DRIVER code for this menu in these procedures, and to SELECT items we will have to write a menu driver procedure (or procedures). □

correction system will default to interpolating (inserting) other sound bits into the gap. CD-audio actually inserts bits held temporarily in an acoustic wave traveling down a crystal, so it always has these duplicated and delayed signals constantly on hand from a fraction of a second before. When interpolated, these aren't the right bits, but with audio 'near enough, is good enough'.

Naturally, you can't use a detection and interpolation system with data. If we are dealing with financial records, for instance, we don't want our CD-ROM deciding to replace a couple of lost 'cost' figures, with a repeat of some 'sales' figures from the last part of the file. CD-ROM needs correction with a fall-back on detection of errors, and warnings of disk failure.

Thus, with CD-ROM and CD-I, a second level of Reed Solomon is superimposed on the CD standard under the name of 'layered ECC'. This is a two-dimensional variety of CIRC, and with this second error correction system in place, you can expect error rates to be less than 1 bit in 1013 (that is only one un-corrected bit-error between 20,000 CD-ROM disks).

I'm not mathematically inclined, but the sheer ingenuity of this system is something to marvel at. When you rid yourself of the preconception that the maths will all be too complex, you will find (as I did) that there's beautifully crafted logic behind the ideas, and they aren't all that difficult to grasp. The essentials I mean – not the detail!

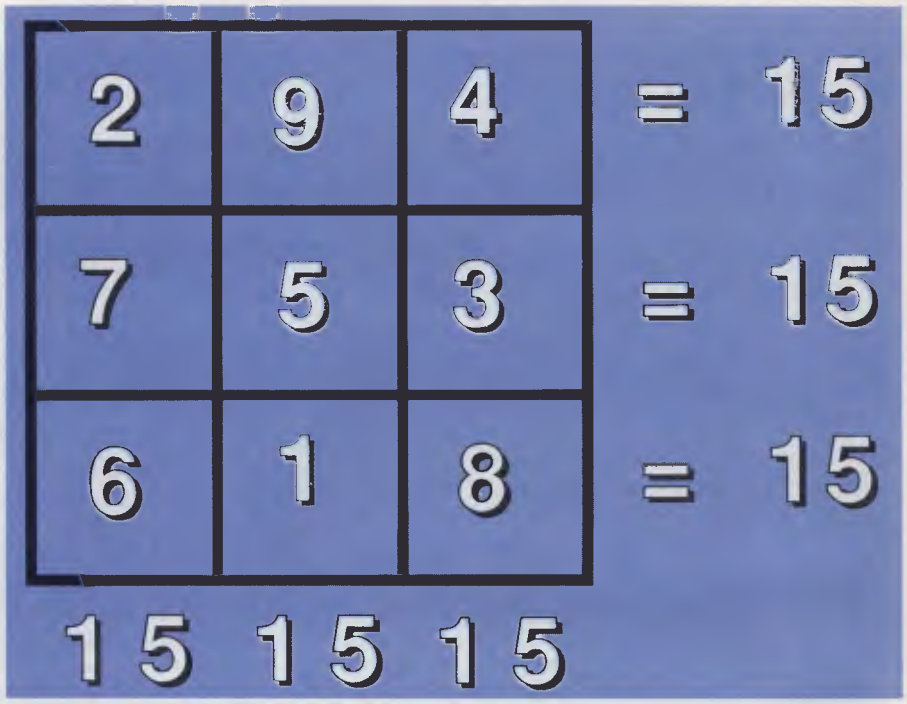


Figure 1. The most interesting feature of a magic square from an error correcting viewpoint is that if you are given one single row, or one single column of numbers, you can calculate what the others must have been.

The checksum

ANYONE WITH a background in computer communications will know the principle of the checksum. At the most basic level, a form of checksum is used for parity checking on a byte-by-byte basis. The 7-bit ASCII code for a character (for example, C, which is 1000011 in binary) is summed in sequence, and an eighth-bit (either a 0 or a 1) is added to make up the parity check – parity needs to be pre-set to odd or even.

This way of just adding individual bits, in binary, is known as modulo-2 arithmetic. In the above example, if parity was set to even, the modulo-2 summation of the binary C would discover three 1s, which is an odd number – so an extra parity bit (another 1) would be added to make it even. The binary for B only has two 1s, so no parity bit would be added since it is already even.

On detection, if a bit went missing for any reason (or a transient bit was inserted by a system glitch), the checksum wouldn't match the modulo-2 addition, and therefore, the receiving computer would know to reject this byte as faulty.

Various higher level communications protocols function essentially the same way. Christensen's XModem, which is used in most bulletin boards for file transfer, sends the data over modems in 128-byte blocks, and follows each block with a 1-byte checksum. This checksum is actually only the last 8-bits of the modulo-2 sum of all 128-bytes. If the receiver's sum doesn't match the transmitted checksum, it asks for a re-transmission of that block. Notice that you get all this data integrity for the overhead cost of only 1-byte in 128-bytes – but essentially these are only detection systems. In CD-ROM we want correction, not just detection, so the checksums are the full-total count (not just the last 8-bits) and there are other 'detection' fail-safe systems included as well.

CIRC (the first Reed Solomon level) sums the data 24-bytes at a time, and it then adds 8-bytes of checksum and other error data (20 per cent overhead). The second level, Layered ECC, sums the data 2048-bytes at a time, and adds 288-bytes of checksum and error data (12 per cent overhead) at the end. So, you can see that with CD-ROM, we pay a fair 'overhead' price for making sure that our data is correct. All this adding up and comparing checksums sounds like a lot of work, but computers do this easily and accurately, so error checking at this level rarely slows the processing down by any significant amount.

Magic squares

YOU MIGHT remember magic squares from your high-school mathematics. These are matrices where the sums of the lines, columns and full-diagonals are always the same. In Figure 1 they all add up to 15.

The most interesting feature of a magic square, from our viewpoint, is that if I only provide you with one single row, or one single column of numbers, you can calculate what the others must have been. If I give you only the first column (2, 7, 6) then by adding these up, you know that the checksum is 15. By some very heavy (but quick) computer calculations, you can work out the value of all the other 6 numbers – there is only one solution. In other words, you have received only 3 numbers successfully, yet you are able to recon-

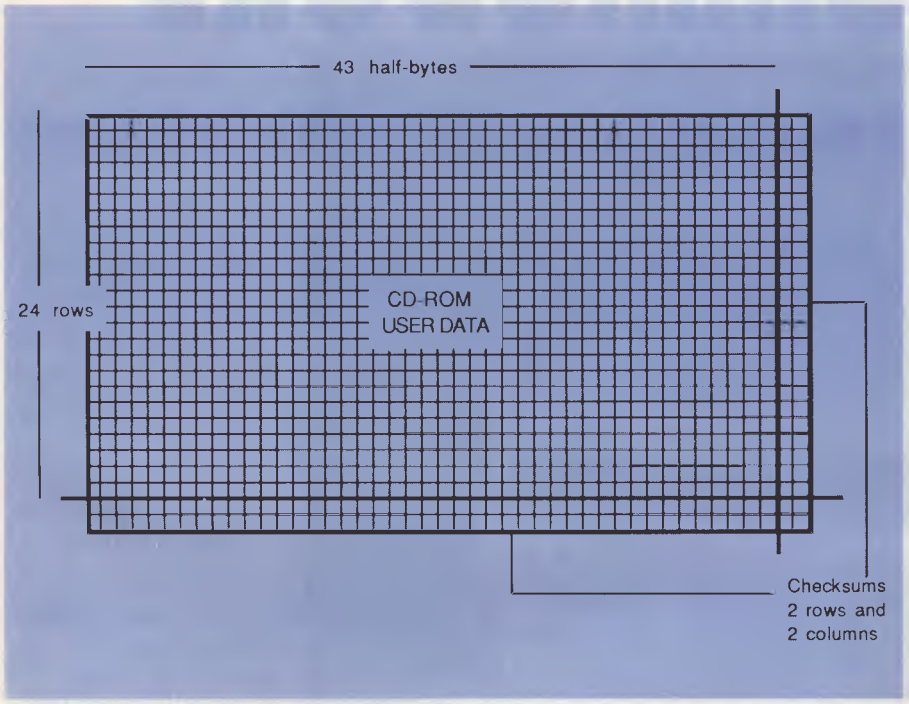


Figure 2. Interleaving of the data blocks for error correction is done in a strictly controlled manner. The data is laid out in a matrix, like a spreadsheet, and the data is added to the matrix from left to right across the rows, moving to a new row every 43 bytes. The 2-byte checksums are calculated for each row and these are added to the end, making 45 columns. When 24 different rows have been filled in this way, the matrix is then read vertically from column number 1 to column number 45, and the 2-byte checksums calculated for the columns, and these are added to the bottom of the matrix. If these blocks of data are now transmitted column-by-column (not row-by-row) you have a clever interleaving scheme which also has most of the attributes of a magic square.

struct a further 6 numbers from the data. Now you are beginning to see how it works, aren't you?

CIRC doesn't work with true magic squares where everything adds up to the one figure, but it does have a checksum on every 24-bytes, and these checksums can be used in much the same way as the magic 15 was in Figure 1. You can't recover twice the amount you receive, but there are other tricks that allow you to do better than you might think.

Interleaving

LET'S NOW suppose that we had a stream of data flowing out from our computer to a modem, or onto a floppy disk. Assume we are transferring the data in 24-byte blocks and adding a checksum – this would be an acceptable standard way of handling important data. However, we would normally transmit the data (or store it on the disk) in strict sequence. We would store or transmit byte number 1, then byte number 2, and so on, up to byte number 24. This would then be followed by the first checksum byte(s), and then by bytes numbers 25 to 48, another checksum, and so on.

The problem with this standard 'sequential' approach is that, if the disk became scratched across one sector, we could easily loose, say, 10- or 20-bytes in a row, from the one block of information – and then the checksum on its own would be virtually useless, except to tell us that there was something wrong.

If the data was being transmitted over phone lines, we could similarly loose a large batch of bytes, in a row, from a lightning strike or other electrical interference. These 'burst' errors would be easy to detect, but very difficult to correct. Here's the clever part of Reed Solomon – to get around this problem, we store our data temporally in the computer, and shuffle it into a totally new order before we transmit it. This shuffling, or interleaving, is always done in a strictly controlled pattern, so it can be unraveled by the computer at the other end. For instance, we may always transmit byte number 7 first, then byte number 29, then byte number 13, then byte 37, then 3, then 20, then the first checksum, then number 24, and so on. As long as the receiving computer knows the sequence to expect, it can hold the bytes and checksums as they arrive in a temporary storage frame and reconstruct the original order. The principle applies to data being transmitted, or prepared, for a CD-ROM master.

In Figure 2, you can see the value of the approach described here. If there's a major glitch in the line, or a scratch on the disk which wipes out, say, one column of data, we'll loose one byte only from the first row, and perhaps one from the second, and one from the third – instead of all the bytes being lost from the same row. If there's only a couple of bytes lost from each row, a combination of the horizontal and the vertical checksums can restore them relatively easily. Now there's one more concept to be added to this lot, and then you've got it all!

In CD-ROM, the bytes are handled in 16-bit chunks – these are actually 8-bit data bytes which are translated into 14-bit 'channel' bits, then another couple of checking bits are added to make up the 16-bits. Therefore, with CD-ROM, they split the first 8-bits off and matrix these together, and the last 8-bits are matrixed separately – so effectively you've got a further interleaving (or alternation) of two halves of each byte.

Generally, with this matrix system, if you receive, say, 80 per cent of the data correctly, you can reconstruct the other 20 per cent by matrix calculations. You can even reconstruct a primary checksum, because you have an interleaved checksum which includes that checksum in its calculations.

With Voyager, Giotto and CD systems, this cross-interleave checking is a continuous process which will totally correct a damaged data stream to a very high level of damage. Eventually, if the disk is badly scored, or there's a lot of electrical interference around during a transmission, there may be so many errors in the data stream that the system breaks down.

With CD-audio, the player will then fall back on interpolating old data – but data system usually warns you or crashes. This is preferable to getting incorrect data. It's clever, isn't it? □

THE COMMODORE

PC30-III

John Hepworth uncovered a compact and expandable system for a small business or home user . . .

REMEMBER WHEN IBM released the AT? Wow! All real power users lusted after a 6MHz 80286, and didn't blink at the price. Since then there has been a steady movement towards machines with higher performance at ever lower prices. Now, an 80286 machine is no longer the province of the power user, but has become the entry level machine for the discerning, but practical, user.

One of the latest in this category is the Commodore PC30-III. It is fully equipped, quite fast, and the price is very realistic. Best of all, it comes from an established manufacturer rather than a back-alley operation.

The PC30-III follows in the footsteps of the Commodore Colt, with great improvement in features and performance while retaining the Colt's compact size and attractive appearance. It is a small footprint AT clone with a 6, 8 or 12MHz clock, and 640Kb of RAM, plus serial, parallel and mouse ports, and battery backed clock/calendar on the motherboard. The review machine also had a 1.44Mb 3½ inch floppy drive, 20Mb hard disk, and EGA card and monitor. Various other combinations are available, including mono monitor and various floppy drive sizes.

Hard disk options include the 20Mb as tested, a 40Mb voice coil, or no hard disk allowing the user to do without a hard disk, or install one of another size or speed.

Set-up!

SET-UP COULD NOT be easier. The machine comes with the hard disk formatted, Dos and the video board installed. As the serial, parallel and mouse ports are on the motherboard, the user just has to plug the monitor's video cable into the system unit, and then plug the system unit and monitor into a power point.

Adding new boards, such as additional serial ports, is easy. Open the case, and plug in the card. When it boots it looks for boards carrying serial ports, parallel ports and similar, it determines which port addresses they are using and then assigns different addresses to the ports on the motherboard. As an example, the serial port on the motherboard defaults to COM1. If another board is plugged in that has a COM1 port on it, the PC30-III reassigns the serial port on the motherboard to COM2.

Some other hardware changes, like setting the time on the battery backed clock calendar, or defining the type of a new hard or floppy drive, need a set-up utility program to reset the configuration CMOS RAM. Two versions of this program are included – one in SET-UP.EXE on disk, the other in ROM and accessed via Ctrl-Alt-Esc. Both work well, though they are cosmetically different. The utility programs can also set the default speed to any of the three available, and these can also be changed at any time.

Externals

THE PC30-III SYSTEM unit is quite compact at 350mm wide, 380mm deep and 150mm high. A 1.44Mb 3½ inch floppy

drive is at the top right corner. Inside the test machine, to the left of these drive bays, a 3½ inch 20Mb hard disk is installed. Also visible on the front panel are a power-on indicator light and a hard disk indicator light.

While the left side is bare, the right side sports the keyboard connector and a push-button reset switch half way towards the back. The rear panel has power switch and power inlet connector, plus the connectors for mouse, 25-pin serial port and parallel port. An audio connector is also included. There are four apertures in the rear panel, one for each of the expansion slots.

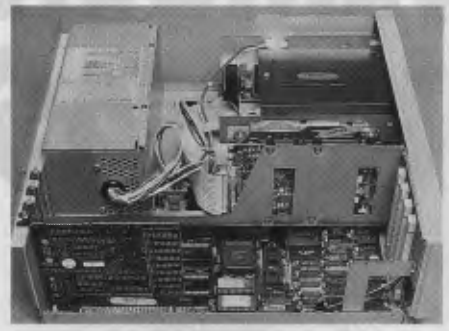
Internals

OPENING THE CASE is easy. Remove half a dozen Phillips head screws, press in the reset switch so it does not foul the case, slide the case back 10- to 20mm, and lift it up. The motherboard covers virtually all the bottom of the case. Along the left hand side are the four expansion slots, of which three are 16-bit slots and one is an 8-bit slot. The video board is in the leftmost slot, while the other three are empty as the standard serial, parallel and mouse ports are on the motherboard.

A steel tray is mounted about 20mm above the motherboard, covering all except the expansion slot area and carries the power supply at the rear, and has mounts for the floppy and hard disks. In front of the power supply are the two floppy drive bays, and to the left of the floppies is the hard disk drive, mounted on its side to save space. The whole tray, including drives and power supply, can be removed as a unit to get access to the motherboard. This reveals a motherboard that mainly consists of a few VLSI chips, plus a minimum number of other chips.

The floppy drive controller is included on the motherboard, and is able to control 2 drives. All cables for the second floppy drive are included. The hard disk is of the integrated AT type, with some of the controller intelligence included on the printed circuit board on the drive itself. It can only control the one hard drive, and the cabling is a single 40 way cable rather than the more familiar two cables found in most AT hard disks.

A socket for an 80287 maths co-processor chip is easily accessible, as it is on the motherboard a little in from the left, towards the front. Standard RAM is 1024K, 640K of which is standard RAM and the remaining 384K is extended RAM, mainly useful for ram drives and caches. While there are no sockets on the motherboard for more RAM, up to 15Mb can be installed on expansion cards in the standard AT slots.



A steel tray is mounted about 20mm above the PC30's motherboard, covering all except the expansion slot area and carries the power supply at the rear, and has mounts for the floppy and hard disks. The whole tray, including drives and power supply, can be removed as a unit to get access to the motherboard.

Bits and pieces

ALL THE VARIOUS bits and pieces seem to be well built and thought out, with the possible exception of the DC outlet cabling from the power supply, and the battery. The power supply outlet cables leave the end of the power supply nearest the expansion slots. They tend to curve over the last expansion slot. Installing a board in this slot would require the power cabling to be pushed aside, and it would always rest on the board. The batteries, for the clock calendar and the configuration CMOS RAM, are soldered to the motherboard, and when a dead battery needs replacement it will be a job for a technician.

The PC30-III as tested came with the excellent ATI EgaWonder multimode video board, and a Commodore 14CH113 EGA monitor. The video board defaults to 25 line EGA mode, but other video modes supported include CGA, mono, Hercules, plus 132-column by 25 line, and 132 column by 44 line modes. A great range of drivers are included so that well known software packages can be used in these 132 column modes. The monitor is a 0.31mm dot pitch unit, with good color, and good resolution. It does have one unusual feature. Most monitors have only a narrow border around the image inside the screen surround, while the Commodore unit has about 2cm blank between the image and the screen surround.

The keyboard has the familiar 101-key layout, with 12 function keys across the top. Feel is pretty good, though a bit soft and with little tactile feedback. Adaptation to it was quick, and reliable touch typing was easy enough.

With the PC30-III come four manuals, a disk which has Dos 3.3, set-up utilities, and utilities and drivers for the video board. The manuals include a 275-page paperback on GW-Basic, a 390-page paperback MS-Dos manual, a 100-page PC30-III user guide and a 56-page EgaWonder 800 user guide.

The manuals are well written and thought out, good for the user with little knowledge, though as with most PCs the rank novice will need some assistance in more difficult matters. Still, few users will need to refer to them much, as the machines come with the hard disk formatted and Dos and video drivers installed, and just need to be plugged in and turned on.

Overall speed was good, with most items having typical speed for a 12MHz 80286. The exceptions were the 20Mb hard disk and the video board. The video is faster than many video boards that I have seen. The 20Mb hard disk had approximately 65ms average access (average if the machine was an XT, but a bit slow for an AT). The specifications for the optional 40Mb hard disk, which was not tested, are for 28ms average access. If this is achieved in practice, it is very good.

Product Details

Product: Commodore PC30-III
From: Commodore Business Machines
67 Mars Road,
Lane Cove 2066 NSW
(02) 427 4888
Price: $3399 20Mb hard disk
$3559 40Mb hard disk
The Commodore PC30-III is an impressive unit . . . Final words? Top value!

Conclusion

THE COMMODORE PC30-III is an impressive unit for a typical small business or home user. It is very competitively priced with the cheapest AT clones, while having good speed, and very good video performance. The compact system unit has the advantage of a small footprint with four slots, three of them free. Final words? Top value! □

ASSEMBLING QUICKBASIC - Part 7

Jeff Richards describes accessing Dos and BIOS services in QuickBasic.

ASSEMBLER ROUTINES that access Dos services are among the most useful that can be written. The types of facilities provided by Dos are extensive, and considerable programming work can be saved by building special-purpose routines that take advantage of these services.

Many of the services available from Dos are already provided for in QuickBasic. For instance, all file management routines use Dos services, as do the printer commands. There are some Dos services, such as setting the current disk or directory, that do not have a direct counterpart in QuickBasic, and these are obvious candidates for assembler routines. But there are also Dos services that are provided for in QuickBasic, but can be more conveniently done through a special library routine. The first routine this month is an example of this – it will interrogate Dos to find out if a file already exists.

The usual procedure for finding if a file exists, is to attempt to open it for input. If the open succeeds then the file exists and it can be closed and re-opened in the correct mode. If the open fails the file does not exist, the program can take the correct action. This complex (and slow) procedure can be replaced with a library routine that consists of a single call that returns a value of true or false.

The routine FEXIST is constructed as a function that takes a string argument and returns an integer result. The result will be true (-1) if the file exists and can be opened, or false (0).

The routine is a simple one that essentially follows the QuickBasic procedure of attempting to open the file and returning a false result if the open fails. There is, however, one small complication. QuickBasic handles strings by keeping note of the current string length. Dos does not require information about the length of the string, but instead requires that the last character of the string is followed by a null character – binary 0. Library routines cannot add characters to the end of a QuickBasic string, so the filename passed to the library routine must first be copied into a local storage area before the null character is appended, and the filename passed to Dos for evaluation. This string checking and copying takes as much code as the actual Dos calls do.

After the initialisation steps, the string length byte is accessed from the string descriptor table in line 6. If the string is not too long, then the full string address is loaded into register DS:SI (line 10). The address of the buffer is then loaded into registers ES:DI (lines 11 to 14). Because the length of the string is already in CX, a REP MOVSB instruction can be used to copy the string. This instruction copies CX characters from DS:SI to ES:DI, incrementing SI and DI as it goes. Register DI will end up pointing one byte beyond the end of the string, so appending a null to the string simply takes one more instruction (line 16). Now we are ready to call Dos.

Calling Dos

CALLING DOS IS a simple process, but an accurate reference to Dos calls is required. The Microsoft *MS-Dos Programmer's Reference Manual* is the complete source for Dos call information, but there are many other sources, including some public domain files. The procedure is to load values into registers and then execute an interrupt. The interrupt for almost all Dos calls is 21h. The function to be executed is loaded into the AH register, and different services may require data to be loaded into other registers.

The example procedure will use function number 3Dh to open a file. The mode value, which is loaded into register AL, is zero, which means to attempt to open the file for input. The address of the file name must be in register pair DS:DX, which, conveniently, it already is. If the call succeeds then a file handle is returned in AX, and the file can be closed. The close function is 3Eh, with the file handle in register BX. Whether or not the open attempt is successful is indicated by the carry bit in the flags register. This is tested in line 21 with the JC command – Jump if Carry is Set.

Note line 20. To load a value of zero into a register, the XOR command is often used. This may be faster and smaller than MOV, but it has the effect of clearing the carry flag. At line 20 we are loading register AX in preparation for testing the result of the Dos call. An XOR would clear the carry flag and prevent us from detecting that the Dos call had failed. Loading zero into AX before the test makes the program a little simpler, but it also lays a trap for those who think they can make the program smaller and faster by using an XOR instead of a MOV.

At line 25, the AX register contains either a zero if the string was too long or the file was not found, or -1 if the open (and close) was successful. Returning to QuickBasic simply involves retrieving the saved registers and executing a RET with a value of 2. The function can be used as a simple expression that is TRUE if the file exists, for example –

```
IF FExist% ('DATA.FIL')
THEN GOTO OpenFile ELSE.(th).(th).
```

Note, however, that the function will return false if the file exists, but there are no spare file handles available for Dos to allocate. In this case, the QuickBasic OPEN would also fail. Therefore, the FExist% function should be used either before any files are opened, or immediately before the required file would have to be opened. The file name can include a disk and directory specifier, but the routine as presented

places a limit of 63 characters on the length of the filename string.

Accessing BIOS Services

WHILE DOS SERVICES provides a wide range of facilities for file management tasks, BIOS services can be considered as operating at a much lower level. The BIOS services operate much closer to the level of the hardware – they are one step above direct manipulation of the memory and I/O ports. There are a large number of BIOS services available, and the main advantage of accessing them through assembly-language library routines is speed.

Many BIOS functions parallel the services provided by Dos. For instance, characters can be written to the display by calling BIOS interrupt 10h or Dos function 2. However, the facilities offered by the two alternatives will differ considerably. Generally, the BIOS will offer more facilities, but usually at the cost of added complexity. The original IBM technical reference manuals are the best references to the BIOS services available, but there are many other references.

The main advantage of accessing [BIOS services] through assembly-language library routines is speed.

The work involved in making use of BIOS services can range from the trivial to the complex. For instance, a routine to print the screen, exactly as if the user had hit the PrtSc key, takes four instructions, two of which could be labeled 'housekeeping'! Information maintained by the BIOS in its data area is accessed simply be reading the location. On the other hand, a complex screen updating routine might require a series of BIOS calls to determine the monitor type, find the active display page, manage the cursor, set display defaults, update the screen, and restore the cursor.

Two examples of using the BIOS will be presented here. Both refer to the keyboard – one uses BIOS calls and the other refers to data in the BIOS data area. They both perform tasks that can be done from within QuickBasic, though not as efficiently, and in both cases the alternative QuickBasic code will be shown.

```
TITLE     KeyBoard     QuickBASIC 4 Library Routine
DOSSEG
;*************************************************************
;* DECLARE SUB ClrKbd ()                                     *
;* Soak up any pending keystrokes from the keyboard.         *
;*************************************************************
PUBLIC ClrKbd
ClrKbd PROC
       push    bp
Again: mov     ah,1        ;Is there a character pending?
       int     16h
       jz      Finis       ;No - exit
       mov     ah,0        ;Else get the character
       int     16h
       jmp     SHORT Again ;And repeat
Finis: pop     bp
       ret
ClrKbd ENDP

;*************************************************************
;* DECLARE FUNCTION KBDSTAT$ (MASK%)                         *
;*      Return Keyboard status word ANDed with MASK%.        *
;*************************************************************
PUBLIC KbdStat
KbdStat PROC
     push    bp          ;Save BP.
     mov     bp,sp       ;Use BP as frame pointer.
     mov     ax,40h      ;Set ES to BIOS data
     mov     es,ax       ;  segment address.
     mov     ax,WORD PTR es:17h ;Get status byte.
     mov     bx,[bp+6] ;Get parameter address.
     and     ax,[bx]     ;AND with status byte.
     pop     bp          ;Retrieve BP
     ret     2           ; and return.
KbdStat ENDP
```

Listing 1. *The routine is a simple one that essentially follows the QuickBasic procedure of attempting to open the file and returning a false result if the open fails. There is, however, one small complication. QuickBasic handles strings by keeping note of the current string length. Dos does not require information about the length of the string, but instead requires that the last character of the string is followed by a null character – binary 0.*

The first routine is designed to clear the keyboard of all pending keystrokes. This is usually required when an error or unusual processing condition has occurred, and all processing should be suspended until a response is obtained from the operator. Clearing the keyboard helps ensure that the important prompt will not be missed as the operator types ahead of the program.

The QuickBasic code to achieve this is –

```
WHILE INKEY$ (cf83);(cf94)(uf1975)
            " " : WEND
```

The library routine is simply the state-

ment CLRKBD. Like the FEXIST% function in listing 2, the library routine will follow the logic of the QuickBasic version. The BIOS will be interrogated to discover if there is a keystroke ready. If there is, it will be collected and discarded. This will continue until the BIOS says that there are no more keystrokes, and the routine will terminate. The routine takes no arguments and returns no results.

Bit	Key/Toggle	State
0	Right Shift	Pressed
1	Left Shift	Pressed
2	Control	Pressed
3	ALT	Pressed
4	Scroll Lock	Active
5	Num Lock	Active
6	Caps Lock	Active
7	Insert	Active

Figure 1. The keyboard status byte at 0040:0017 indicates the above keyboard states.

The BIOS keyboard routines are accessed through interrupt 16h. There are about 8 keyboard functions (depending on the model of the PC), and the function number is passed in the AH register. In this case, the function required is number 1 – 'Get Keystroke Status'. This function will return with the zero bit in the flags register set if there is no character ready to be read. In this case, the routine jumps straight to the end and exits. If there is a character, function 0 of interrupt 16h is used to read it, and the routine loops back to the beginning to see if there are any more characters. When the routine terminates there will be no pending character in the keyboard buffer, and the calling program can display the warning message and wait for the operator response.

The second example is a little more complex. This one is a function that will return the status of the keyboard toggles. This information is stored at location 17h of the BIOS data segment, which starts at segment address 40h. The byte at this location is logically ANDed with the supplied mask to provide a non-zero result if the key is pressed or the toggle is active, and a zero result otherwise. Note that this status byte can also be obtained through interrupt 16h – directly reading the BIOS data area is used here simply to provide an example that contrasts with the previous example.

The QuickBasic code for this function here is –

```
DEF SEG = &H40
Result% = PEEK(&H17) AND Mask%
```

Using the library routine the code becomes –

```
Result% = KbdStat% (Mask%)
```

The code for the routine is as simple as the description suggests. Because a parameter will be accessed using BP, this register must be saved on the stack and the contents of the stack pointer copied into it. Then the ES register is set to the BIOS data segment address (40h) and the byte at offset 17h is copied into register AX. This is logically ANDed with the supplied parameter to produce a result in AX, which is returned to the calling program when the routine terminates.

The value of Mask% should be set so that the required keys are tested. For instance, to see if either shift key is currently pressed, use a mask value of 3 – bits 0 and 1 of the byte set. For instance–

```
IF KbdStat%(3) THEN PRINT 'One or
        both shift keys'
```

– note that this technique is particularly useful when cursor keys and function keys are being trapped using ON KEY. By testing the keyboard status immediately the key is trapped, it is possible to separate the shifted, Control and Alt states of these keys – something the QuickBasic ON KEY statement cannot do.

The range of possible BIOS functions is too large to cover here. Usually, BIOS functions will be used as a part of a larger, more complex, routine rather than in their own right. For instance, a windowing system will make extensive use of BIOS routines, as well as direct reads and writes of video memory. It is unlikely that the BIOS disk routines would prove very useful, but the keyboard, video, comms port, printer, and system status BIOS calls can be put to good use providing programs with easy access to these facilities. □

```
TITLE     FEXIST     QuickBASIC 4 Library Routine

PUBLIC FExist

;*********************************************************
;* FUNCTION FExist (F$)                                  *
;*      Return TRUE (-1) if the pathname F$ exists,      *
;*       otherwise return FALSE (0).                     *
;*********************************************************

FExist PROC                 ;0  Procedure starts here.
      push      bp          ;1  Save the frame pointer.
      mov       bp,sp       ;2  Initialize stack pointer.
      push      di          ;3  Not essential, but
      push      si          ;4   recommended.
      mov       bx,[bp+6]   ;5  Access the function parameter.
      mov       cx,[bx]     ;6  Get the string length.
      mov       ax,0        ;7  Assume an error
      cmp       cx,64       ;8   and then test for it.
      jnb       NoFile      ;9  Exit if string too long.
      mov       si,[bx+2]   ;10 DS:SI is source string.
      push      ds          ;11 ES = DS.
      pop       es          ;12
      lea       dx,buffer   ;13
      mov       di,dx       ;14 ES:DI is destination.
      rep movsb             ;15 Copy it (CX has the length).
      mov       [di],BYTE PTR 0 ;16 Add the null character.
      mov       ax,03D00h   ;17 Dos function 3Dh, Mode 0
      int       21h         ;18 Call Dos.
      mov       bx,ax       ;19 Move the file handle to BX.
      mov       ax,0        ;20 Assume a false result
      jc        NoFile      ;21 and exit if it was,
      mov       AH,03Eh     ;22 else, do function 3Eh (Close)
      int       21h         ;23 and call Dos (BX has the handle)
      mov       ax,-1       ;24 and return a true result.
NoFile:
      pop       ds          ;25 Retrieve Registers
      pop       si          ;26
      pop       bp          ;27
      ret       2           ;28 and finish.
FExist      ENDP              ;29 Procedure ends here.

Buffer  LABEL  WORD
      DB        64 DUP (?)

END
```

Listing 2. *The library routine is simply the statement CLRKBD. Like the FEXIST% function presented above, the library routine will follow the logic of the QuickBasic version. The BIOS will be interrogated to discover if there is a keystroke ready. If there is, it will be collected and discarded. This will continue until the BIOS says that there are no more keystrokes, and the routine will terminate. The routine takes no arguments and returns no results.*

MAC-WORD POWER-

MACWRITE II AND NISUS

Stewart Fist compares two thrifty and powerful word processors for the Mac.

LAST MONTH in 'Mac-Word Power' I wrote a review on an 'almost word processor' called QUED/M (which I highly praised) and in that piece I mentioned that the publishing company Paragon, was in the process of creating a fully-fledged word processor using QUED/M as a base.

Nisus has since appeared, and I'm grouping it here with MacWrite II in a comparison of the best of the second-order word processors available for the Macintosh. FullWrite Professional and Microsoft Word 4.0 (reviewed in December 1989) have to be treated as first-order word processing programs because they virtually offer full desktop publishing characteristics together with thousands of other bells and whistles. Nisus isn't quite in their league, although it is better in other directions.

I'm not suggesting that second-order means second-rate, either. These programs aren't inferior in any way – just different. Both MacWrite II and Nisus are excellent products for their own markets. I have no problems in recommending both of them over FullWrite Professional for normal use – and if you don't have need for all the special functions of Word 4.0, then I recommend that you treat these as an alternative here also, and possibly save yourself money.

MacWrite II

I'VE ALWAYS BEEN a keen advocate of the KISS (Keep it Simple, Stupid) school of software design, and MacWrite has certainly been a popular example of this philosophy at work – almost to a fault. But I do need a spelling checker and the old MacWrite was abandoned long ago.

Fortunately MacWrite II, fully equipped with a spelling checker, has finally hit the streets after a very extensive debugging period. I had a beta copy for many months, and the release copy for a couple more, and I must say that the program seems to be excellent.

The main changes Claris has made since it took MacWrite over from Apple are added spelling checker and automatic hyphenation, multiple windows/documents, changed file format, added thesaurus as a desk accessory, and other minor improvements.

The most noticeable feature on boot-up is a dramatic extension to the list of menus across the top bar. Quite frankly, this filled me with dread when I first saw it, it seems to be contrary to the MacWrite-KISS tradition. But if you're going to add functions, then you've got to find ways of activating those functions.

Spelling checker

THE FIRST, AND probably the most useful of the new functions is the spelling checker which takes either of two forms (via a dialog box). You can switch between checking as you write, or only after you've finished.

In the release version this works nicely and it is reasonably fast, and it's in Australian English. Unfortunately in this version you don't get a word count – it disappeared between the beta and the release – which is a pity for journalists, but not much of a problem for most people.

Spelling checkers are getting better every day, and this new one takes into account that there will always be tradenames and odd words which it won't recognises. So if you decide to 'skip' the word (accept it as written) it will skip all instances in the document, but for the duration of the current check-run only.

You can, of course, add these words to a User Dictionary very easily by clicking on a Learn button. Whenever the program finds a doubtful word it also presents a scroll-box with six 'possible' words for your selection, and if you click on any of these (or make your changes directly into the dialog box) you can automatically insert them into the document simply by clicking on a Replace button.

The thesaurus is Word Finder from Microlytics, and is a desk accessory – it's not part of the program. You activate it through the Apple menu, and it adds its own 'WF' menu to the top bar, and remains there for the session. You can also activate Word Finder with the default 'Command L' key. Microsoft Word 4.0 uses a Microlytics thesaurus DA also, but it's a different model and neither will work with the other program.

When you click on the 'Lookup' button, you are very quickly presented with a list of synonyms (it is much faster than the spell checker) carefully divided into the various parts of speech (noun, verb, and so on) and sub-divided into the different meanings as in a good dictionary. If you click on any of these presented words you can then choose either to Replace the original in the document, or Lookup another synonym list again. This last function is quite important, and not found in most thesauruses. Anyone who writes a lot will understand how important this thesaurus chaining process is.

The bugs in the Word Finder are minor, but annoying. Firstly, it will find either the word 'boy' or its plural 'boys', but it treated plurals as singular by removing the 's'. So you can replace 'boy' with, say, 'child', but not 'boys' with 'children' Secondly, it can't handle possessives like 'boy's', and it doesn't know enough to reject full-stops, so if you accidentally include punctuation at the end of a word it will tell you that it doesn't recognise the word.

Other changes

LET'S GET OUR priorities right here. Multiple windows, documents and columns are now here – as they should be, and these features alone take MacWrite II up

to the edge of the desktop publishing area. You can have up to seven windows open, and you can have up to ten columns to each page, with or without page-guides showing. MacWrite II will also hand MacPaint, PICT or PICT2 images, and cut, paste, resize and modify images in the word processed documents, but it doesn't have a text-wraparound feature.

There has also been a radical improvement in the speed of scrolling which was one of the things that drove me up the wall with the old MacWrite. In fact, it was probably the key factor in making me use Microsoft Word whenever I had more than a few pages to compose.

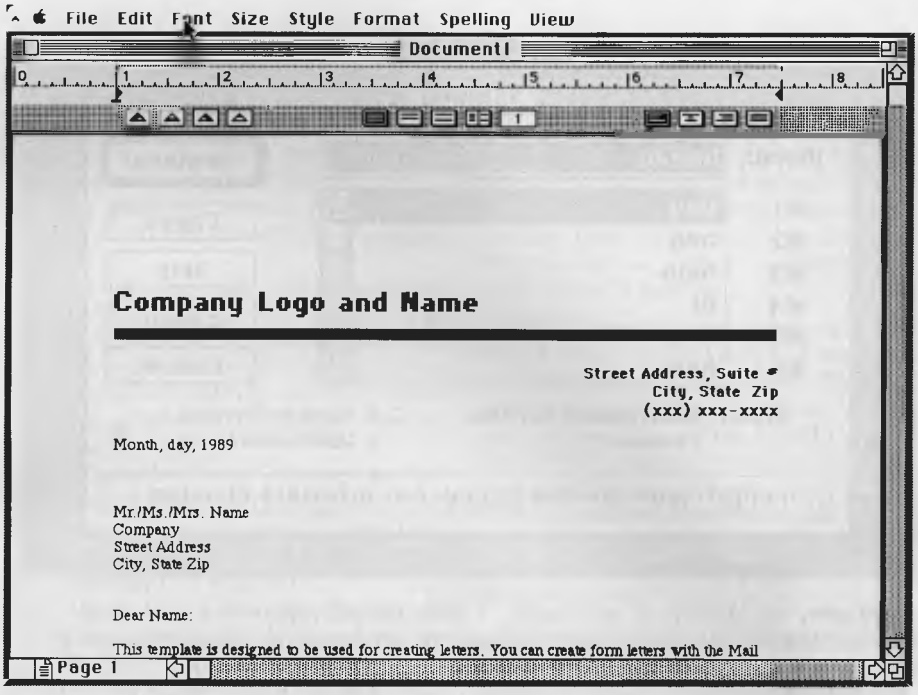
At the same time they've added a Select All in the Edit menu with its own (Command A) keyboard combination – which, let's face it, should have been there all along. This was where the slow scrolling really took its toll in the old program.

For repetitive formats, Claris has provided a Save As, Stationary selection under the File menu. Any time you need to repeat this page-layout format, you simply open the template as if it were a file, and the program adds a new temporary name so as not to overwrite the template file. The template can include text (such as name and address), and graphics (such as the company logo) in addition to the full range of page formatting including type style and size.

Then they've added a mail-merge function under the File menu – quite possibly the best simple merge system I've seen. It takes its data from a tabbed standard word processed file but it has conditional control (IF THEN ELSE), and the standard arithmetical (equal to, greater than, and so on.) and Boolean (AND OR NOT) operators.

Claris have given a lot of thought to making the program simple to use. One excellent example is a very simple, but fabulous, Insert File menu selection that is the old MacWrite equivalent of: closing your current document file temporarily, opening the file which has the text you wish to insert, scrolling through to select all the text, copying this to the clipboard, closing this file, opening the original document again, and pasting in the inserted material from the clipboard. Now one menu click and a dialog box selection does it all. Let's hear three hearty cheers for the MacWrite programmers !

Last in this section is the fact that we now have Headers, Footers and Footnotes (which can be either allocated to a page, or shoved down to the end) and you can opt out of the Headers and Footers on the title page with a simple format selection. These controls are all found under the Format menu along with forced Page- and Column-breaks, and a selection which enables you to scale imported images.



For repetitive formats in the MacWrite II program, there's a Save As, Stationary selection under the File menu. Any time you need to repeat this page-layout format, you simply open the template as if it were a file, and the program adds a new temporary name so as not to overwrite the template file. The template can include text (such as name and address), and graphics (such as the company logo) in addition to the full range of page formatting including type style and size.

Nice to have it

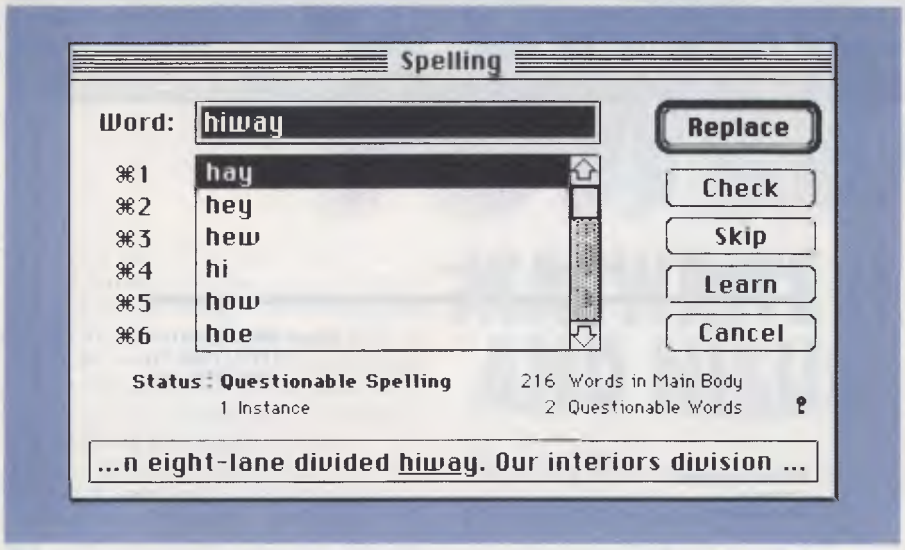
GETTING NOW TO the 'Nice to have it but wouldn't sweat if I didn't' category is the ability to set line-spacing in half-space increments up to 10 (which gives you two lines of text to the screen), or you can choose even finer customised spacing if you require. There are also changes to the appearance of the Font menu which writes the menu names in the font-styles themselves. This makes it easier to choose some of the weird and wonderful fonts cluttering up your system folder – it's a real plus.

Under the Style menu you now also have Double Underline and Strike Thru (their spelling, not mine!), and you can colour your fonts and customise your font sizes if that's what takes your fancy.

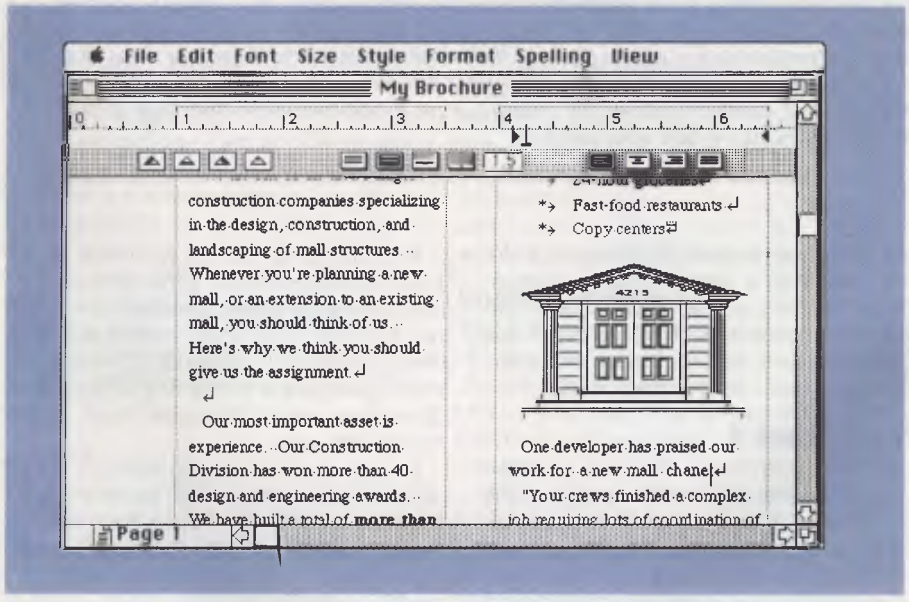
The Edit menu now lets you insert Date, Time and Page number either by pointing and clicking, or using Command keys, and you can set your style preferences for these through a 'Preference. . . ' selection which gives you a dialog box with all the choices we use in Australia – no more month-first dates.

To sum it up in a couple of words – excellent but definitely still second level! There's a lot of very good new functions, a lot of improvements, and they've achieved this without overloading the interface too much.

The major negative (if I had to be critical) is that they have completely changed the old MacWrite file format to the point where MacWrite files now need to be translated before they can be used in this program. You can export in a variety of formats including MacWrite 5.0 and the various Microsoft file types (not Word 4.0), but the old MacWrite file seems to have disappeared forever as a Mac standard. It was inevitable if they were ever going to upgrade the old program.



When using the Macwrite II spell checker, a dialog box will appear on screen. At the bottom of this box there is a rectangle containing the text around the questionable word so you can recall what you were talking about and decide whether to correct it.



The most common way to bring graphics into a MacWrite II document is to cut and paste from a bit mapped graphics program like MacPaint.

Nisus

THERE'S NO DOUBT about Nisus's origins in QUED/M. In case you didn't read that review or you've forgotten, let me refresh your memory. QUED/M is a text editor with basic word processing capabilities, and many special text-handling features that just aren't found in standard word processing packages.

For instance, you have a command to Zap Gremlins which means to get rid of characters formed by using the Option or Control keys which might be cluttering up a file transferred from another source. One click and their gone!

QUED/M also handles its files in a totally different way. Without getting too technical, the main data fork of the file holds the characters essentially only in ASCII form – formatting is shunted off to the resource fork of the file. In practice this means that the program can handle virtually any file generated on the Macintosh, and with some special filters it can even use the old file formatting. It does this with Word 3.0, but not with 4.0 yet.

In the review, I said that you'd be interested in QUED/M if your work emphasises the 'content' side of text, databases or programming, as distinct from the 'display' or 'appearance' side (layout, formatting, and so on). If your job involves computer communications, file transfers, desktop publishing, programming in dBase (or any similar language), checking multiple-author reports, sub-editing text for typesetting, translating data between databases/text files, then you would probably use this program fairly regularly.

I've got to modify that opinion now, because Nisus is the program you want – not QUED/M. That's now just for programmers. So let's talk about Nisus.

First of all, it needs a megabyte of memory, so it's a program for the Mac Plus and above. Nisus is a memory-based program which makes it fast, and this also means that it will work quite well on a Mac Plus with a couple of 800K drives, but better still on a hard disk.

Paragon has come up with a well written, tabbed, indexed manual for the program which is a major improvement over QUED/M's manual. This new program now has so many features that you can't possibly use more than a small part of what's available without having reference to a manual.

I'm not going to bother you by talking about all the normal word processing functions that you find on modern word processors. Take it as read that Nisus can handle multiple windows, graphics with the text, and the normal range of fonts, sizes, styles, and so on. You can also cut and paste, search and replace, check spelling, look-up words in a thesaurus, add headers and footers, and so on. Now let's talk about what makes Nisus special.

Under the Tools menu, you will find a primary list of seven: Check Spelling, thesaurus, and five others, each with their own sub-menus (Display, Edit Tools, Book Tools, Windows and Macros). Each of these would require a chapter to outline in full, but the main functions are –

Display – lets you chose rulers (Graphic or Text), show invisible text (hypertext-

type function) and control page and line numbering;

Edit Tools – lets you compare two different files to see if there's variation, and it controls the sync scrolling of two files on the screen simultaneously;

Book Tools – are to do with indexing, making contents pages, creating Glossaries and many other book publishing functions;

Windows – controls the appearance of multiple files on the screen. Do you want them Stacked (overlaid) or Tiled? And it also handles ASCII insertion of special characters or symbols;

Macros – is fairly self-explanatory at this level. It allows you to record or edit a macro and store the results in a file. You can also swap existing macro files through this sub-menu. However, in Nisus the record actions is only the most basic way of creating macros, and the program comes supplied with a great number already written.

Below the Macro menu selection is a scrolling list of macros that come with the program. They are stored in a separate file that is automatically loaded when you boot up Nisus. On my count there are 85 of these, of which I would probably use five often, and possibly another ten or twelve on odd occasions. If I could be bothered wading through the list and the manual, I'd probably find more – but I'll wait until I'm desperate.

Nisus 2.0

SINCE I REVIEWED Nisus 1.0, a new version 2.0 has been released and is substantially better. The old version was great, so I need to find another superlative for this version – 'greater' will do.

I don't know why, but Paragon has changed the Nisus file structure. The old version of the program will now only read version 2.0 files as ASCII without formatting, so they must have made some substantial changes here.

The other major changes are include: automatic hyphenation with manual override (which you must have with hyphenation systems), and footnotes and end-notes.

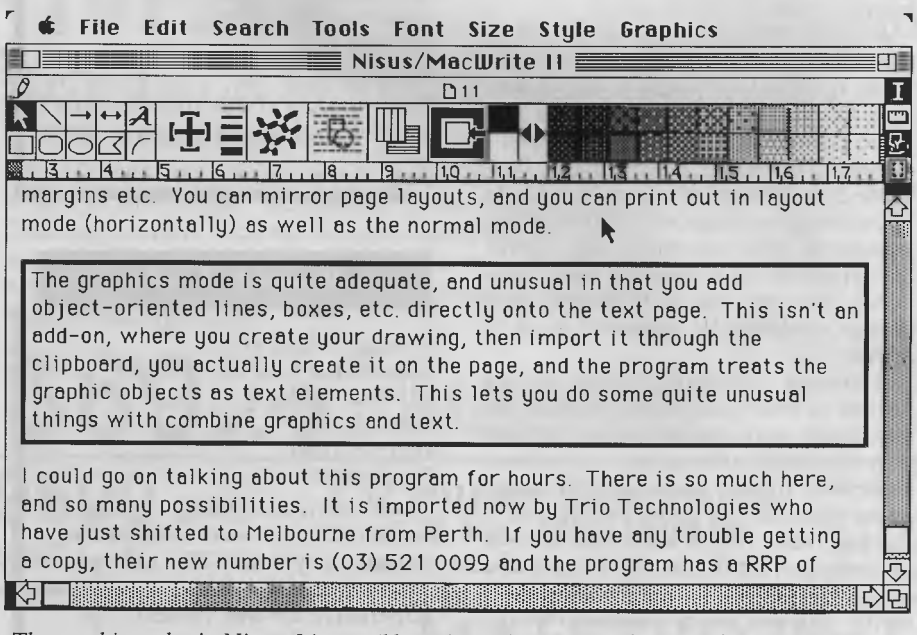
If you have a color monitor, simply select an area of text and color it via the Style menu. Color is treated as a font style. This makes the system quite useful even if you don't have a color monitor, since Nisus can race through and select/change text on the basis of style. Now you can tag different parts of your text by making a style change (by selecting a monochrome 'color') that only the computer can see – it's almost as good as Word Perfect's Redline.

With subscript and superscript, Nisus now has two reduced font sizes for formulas and equations. The Shift-Enter function now forces a new line (as does the normal Enter) but without the paragraph initiation function. If you've got a style set-up which creates an indent at the beginning of each paragraph, this key combination can over ride it, and is very useful for desktop publishing and sub-editing.

Foreign and special language dictionaries such as French, German, Italian, Norwegian, English Legal and Medical dictionaries are also included in Nisus 2.0.

Nisus uses a macro programming language derived originally from Unix. You can use this language to write your own macro procedures to do all sorts of complicated things. I spent some time working with regular expressions when I did the QUED/M review, and it wasn't as difficult to learn as it first appeared – although I must say that I've already forgotten most of what I learned.

If you want to exercise the grey matter, there's a whole section in the manual that talks about the Global Regular Expression Parser (GREP), Easy-GREP, and the use of metacharacters, so if you want to delve into this, you're welcome to it.

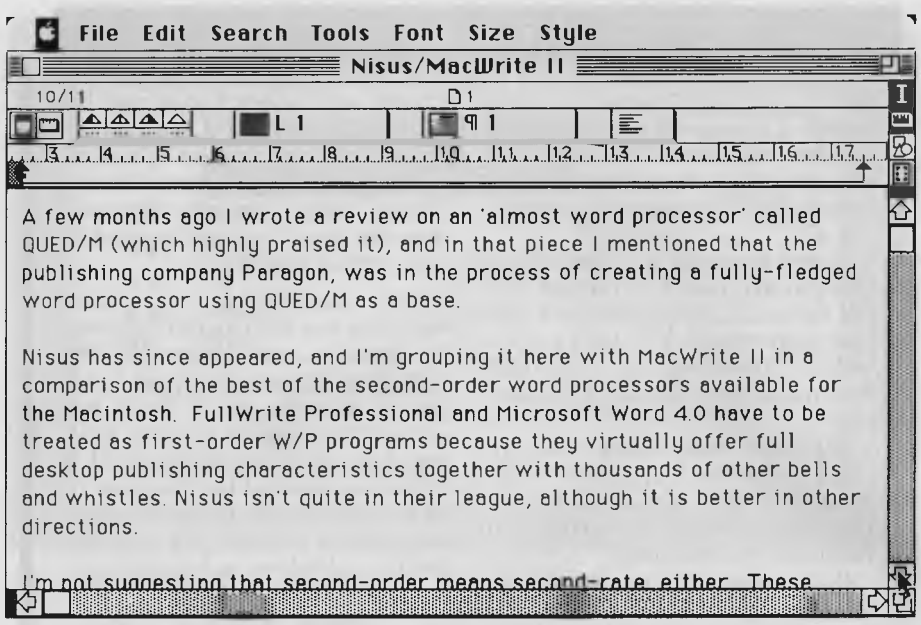


The graphics ruler in Nisus. It's possible to draw object oriented images directly onto the page.

Macro emphasis

WHY SUCH EMPHASIS on macros? This is where Nisus actually gets its power, and this is what makes the program stand out as a text-worker's tool. A sub-editor can use the program to zip through and knock out all those double words, or change American spelling to Australian, or convert all dates to a standard format. You might want CSIRO to be spelled in all capitals, except when it precedes the word Net – and with this type of macro facility you can automate this so you don't have to do it manually every time with new copy.

Now, what you have are macros that swap words, and others that swap letters, which are always a hassle with editing copy, so a simple macro makes it easy. There's two that deserve special mention: Remove Blank Lines which does what is says, and Widow and Orphan Control



The text ruler from Nisus, offering all the usual features. Note the icons to the right of the ruler.

which prevents a single word or a partial line of text hanging over on a page or column in isolation. You'll discover dozens of others you can use, and you'll probably end up creating even more yourself, if you do text editing on a regular basis.

Now, all of the above would be pretty useless if Nisus could only handle its own files, but this is another area where the program excels. Because of the fundamentally intelligent design of its file-handling system, the program seems to be able to see, find and open virtually everything. For instance, if you try to open a Microsoft Word 4.0 file (which was released later than Nisus), you get a line or so of junk, then the full ASCII text of the file plus a couple of pages of junk on the end. If you select and get rid of the junk, you'll have a workable file again.

I hear that the next version will include a Word 4.0 filter so that formatting can be preserved. Nisus already has a filter for Word 3.0 which preserves the formatting as long as the file wasn't saved using Microsoft's Fast Save option (if you did, Nisus tells you!). There's also a filter which needs to be installed in a copy of Pagemaker 2.0 or 3.0 to allow you to place Nisus documents into that program direct. I'm not too impressed with this approach.

This review is beginning to read as if Nisus is only for very experienced computer people doing specialised things, which is partly true, but there's also a good case for Nisus as a basic word processing program for beginners – as long as they aren't the type who will freak out when they see the never-ending list of macros under the Tools menu.

A couple of features, such as the unlimited Undos and Redos, make Nisus particularly suitable for novices as well as editors. At present, when I select the Edit menu I find that I am up to Undo Typing number 214, which means that I have made 214 different cuts and changes to this copy since I began writing (which says something about the erratic way I write). The program isn't counting each additional character, but it is storing every change, whether it be a deletion, or an insertion.

A second comforting feature for the novices is that Nisus creates backups automatically, and you can pre-set it to save your current text after a certain amount of keystrokes. There's a very substantial submenu selection list under Preferences in the File menu. These allow you to issue relatively permanent commands as to how you want the program to function under eleven different major headings. This is customisation with a capital C!

There are also ten clipboards and you can constantly reuse one or cycle through them one at a time. What's more you can add material onto text already stored in a clipboard; this makes the program excellent for skimming through old documents and extracting material a paragraph at a time.

The ability to set markers in your text, and jump instantly from one to another, also makes compilation writing easy. This, combined with the multiple clipboards, almost substitutes for an outliner – which they haven't provided.

There's a pretty good page-layout function with a choice of columns, margins and so on. You can mirror page layouts, and you can print out in layout mode (horizontally) as well as the normal mode.

The graphics mode is quite adequate, and unusual, in that you add object-oriented lines, boxes, and so on, directly onto the text page. This isn't an add-on, where you create your drawing, then import it through the clipboard, you actually create it on the page, and the program treats the graphic objects as text elements. This lets you do some quite unusual things with combine graphics and text. □

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Product: MacWrite II
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To sum it up in a couple of words – excellent but definitely still second level!

Product Details

Product: Nisus v2.0
Distributor: Trio Technologies
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Black Rock 3193 Vic.
(03) 521 0099
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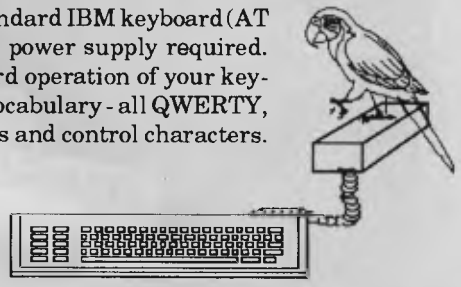

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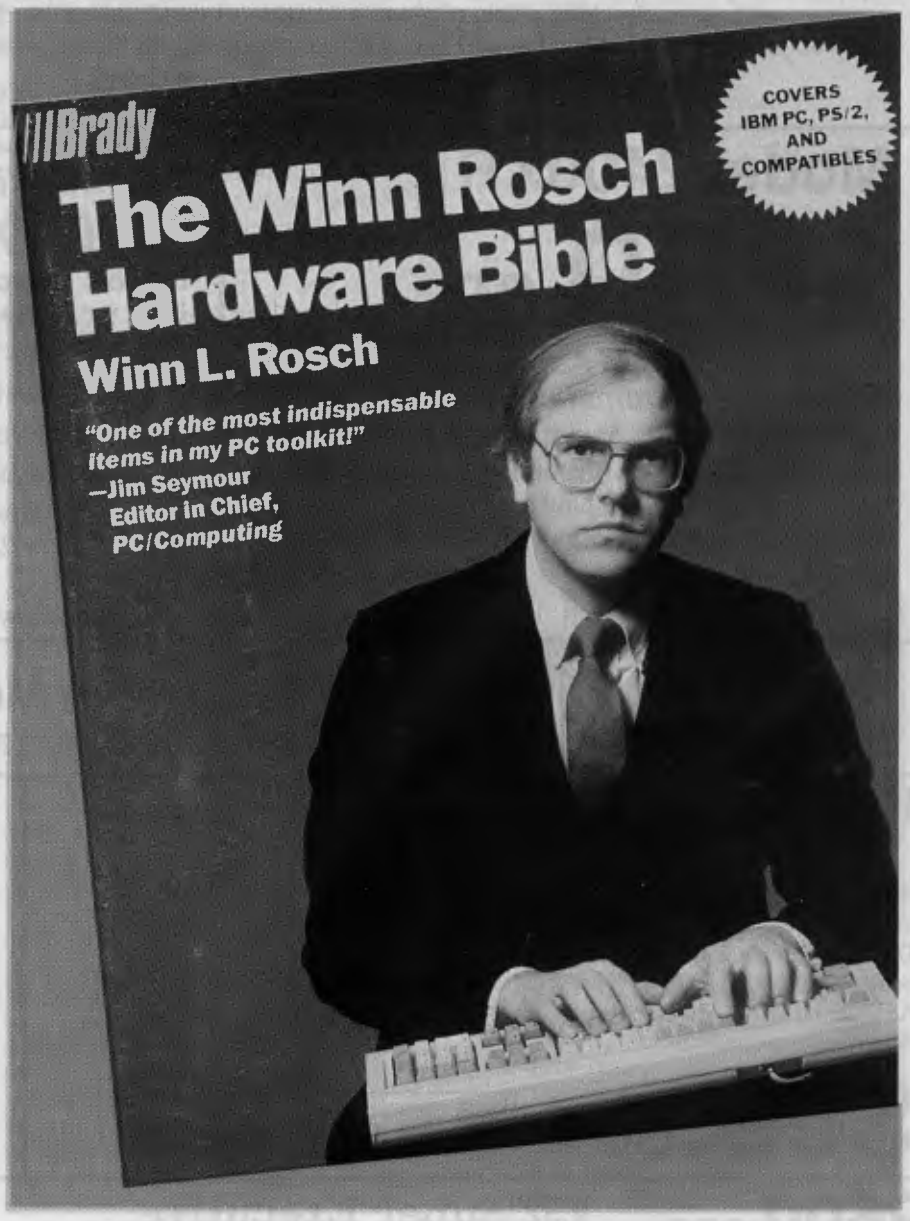

CARS CAN BE driven without knowing what is under the bonnet, but when drivers have even a general understanding of what is inside, the job at hand is done far better. It's the same with a PC.

Everyone, at some stage, has wondered what is inside a PC, or the difference between a normal, microchannel, or an Eisa machine. You could look in a series of manuals and try and glean the information, or go and get a text book. Unfortunately, most of the available books take a very technical approach and baffle the average reader with content aimed at programmers or electronics buffs.

Not so with *The Winn Rosch Hardware Bible,* by Winn L. Rosch, a renowned journalist in the American computer press. Despite a rather sombre cover, with a bespectacled dark-suited man peering into the camera while cradling a keyboard, it takes a very laid-back approach. In narrative style, the book describes all the various parts of a PC, from keyboard to screen, with detours via drives, expansion boards, BIOS and the other parts of the system unit. Where there are various possible options, as with video boards, a range is comprehensively described.

Despite having such a relaxed and easy-to-read style, it does not shirk hard technical information. Included are many practical details of immediate use to the intermediate user, like installation of an additional hard disk or a 3½ inch floppy drive. It even shows how to remove and replace various motherboards, and has tables of the most common configuration switches and their settings. While it does have an amazing amount of detail it doesn't get trapped into trying to describe specific fault-finding techniques or excessive chip-level board descriptions.

The Winn Rosch Hardware Bible is a very easy, and enjoyable, book to read. It's suitable for any user, from raw novice trying to understand more, up to quite advanced users, though really advanced technical types may look for more hard data and less words. Published by Brady books, it's priced at $59.95 □

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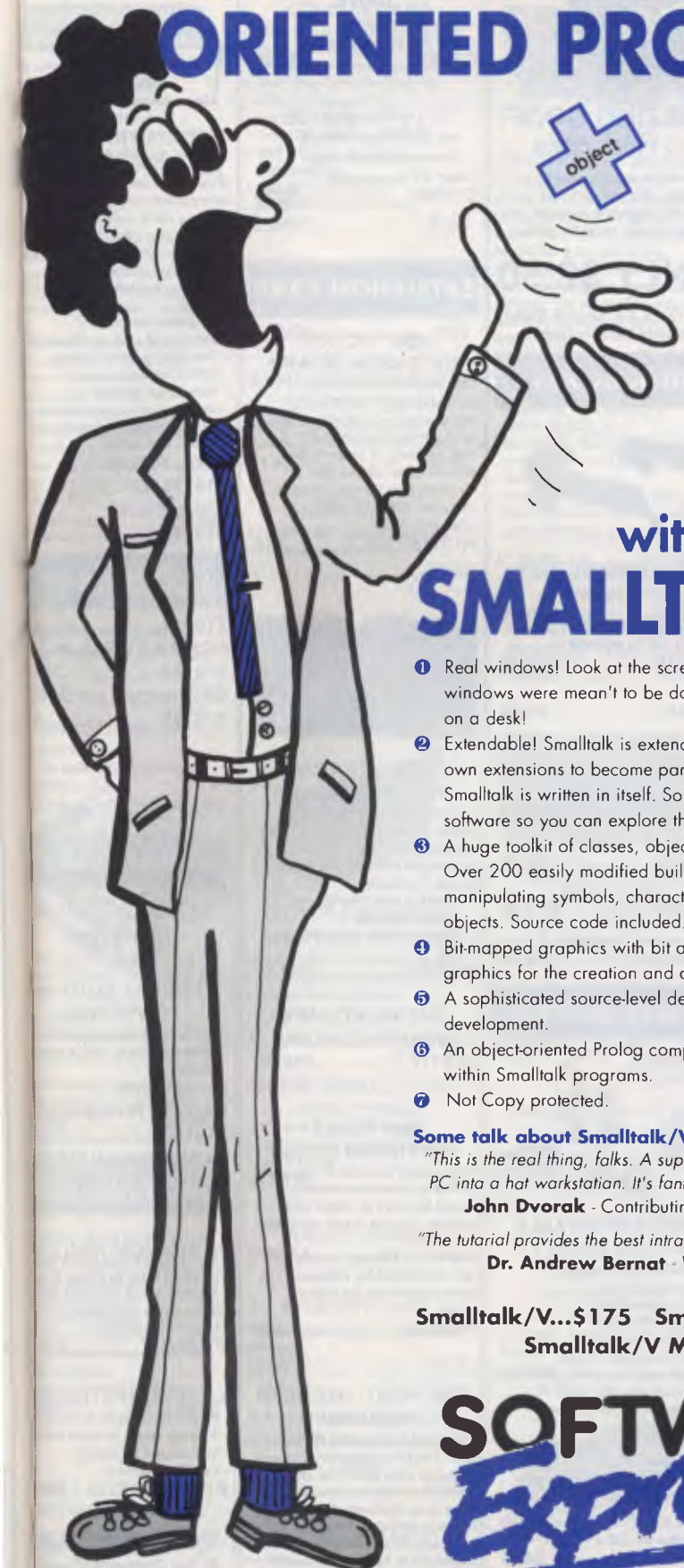

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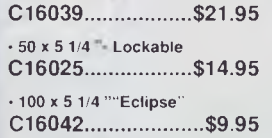

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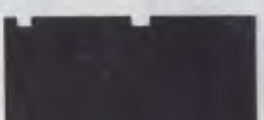

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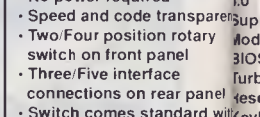

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PC*/ XT*/ AT* compatible 256K Ram works with OS/2

X18071.....$350

VGA 512K

PC*/ XT*/ AT* compatible 512K Ram. Hardware zoom, pan, window.

X18072.....$450

FLOPPY DISK DRIVE CONTROLLER CARD

These cards will control up to 2 or 4 double sided 360K IBM* compatible disk drives

For 2 Disk Drives

X18005.....$52

RS232 (SERIAL CARD)

WITHOUT CABLE

Supports 2 asynchronous communication ports. 50 baud to 9600 baud.

X18026.....$39

CLOCK CARD

X18024.....$49

PRINTER CARD

Parallel interface for Centronics printers.

X18017.....$29

3.5 M/BYTE EXTENDED/ EXPANDABLE RAM AT* CARD

X18056.....$275

I/O PLUS CARD

Provides a serial port, a parallel port and a joystick port, and even a clock/calendar with battery backup!

X18045.....$115

POSTCARD DIAGNOSTIC MODULE

Pinpointing component problems in IBM* compatible motherboards can take hours. Usually the whole system has to be working to isolate the troubled area. But not so with the new Postcard Diagnostic Module. So no other cards are necessary to test a bare motherboard.

"It now only takes seconds."

Simplified debugging for:

- Field service- for on-site repairs or maintenance depot work
- Manufacturing test- for burn in test flaws and to do quality control
- Inspection- Postcard simplifies incoming and outgoing test processes on stand

X18048.....$849

2 M/BYTE EXTENDED MEMORY RAM CARD

X18052.....$225

MULTI I/O & DISK CONTROLLER CARD

This card will control 2 x double sided, double density drives, and features a serial port, a parallel port, and a joystick port or games port. It also has a clock/calendar genarator with battery backup

X18040.....$99

SERIAL/ PARALLEL/ GAMES CARD

XT*/ AT* compatible 1 parallel port, 2 Serial ports, 2 port games adaptor.

X18151.....$115

4 WAY DISK CONTROLLER

- PC*/ XT*/ AT* compatible
- 1.44 M/B, 1.2 M/B, 720K, 360K Drives

X18006.....$129

GAMES I/O CARD

Features 2 joystick ports.(DB15)

X18019.....$29

MIDI INTERFACE CARD - DS/401

The MIDI DS-401 Card is the PC standard MIDI interface that runs most popular PC music programs for sequencing, recording, composing, music printing, patch editing, music instruction and many other applications.

- Run all programs designed for the Roland MPU-401 architecture
- Socketed EPROM for easy user replacement
- 1/3 length (short) card will fit in any computer accepting standard expansion card, including laptops
- Including "Y" cable, external connector box to transport is unnecessary

X18164.....$245

386 CACHE 25MHz MOTHERBOARD

- Processor 80386-25
- Cache controller 82385-20
- Speed: 25 MHz or 20 MHz
- Memory: 32KB Cache memory (35ns)
- 2 M/Byte RAM fitted (80ns)
- 2/8 MB plus 32 bit memory card
- Expansion slots: 1 x 32 bit, 5 x 6 bit, 2 x 8 bit
- Intel* Combo Chip set: 82230, 82231
- BIOS: AMI
- Landmark Test: Up to 43.5 MHz
- LED display for speed indication
- Ability to run OS/2, MS/DOS, XENIX
- Baby AT* size board

X18105.....$3,000

386 MAIN BOARD

- Intel 80386 CPU (20 MHz)
- Socket for 80387 Math co-processor
- 32 bit Memory BUS system
- Built-in speaker attachment
- Battery backup for CMOS configuration table and real time clock
- Keyboard controller and attachment
- 7 Channel DMA
- 16 Level interrupts
- 3 Programmable timers
- 8 System expansion I/O slots
- Including 2 M/Byte RAM

X18107.....$1,600

286 NEAT MOTHERBOARD

- Processor: 80286-12, -16MHz or -20MHz (0/1 wait state)
- Co-processor: 80287 (optional)
- CHIPS & TECH NEAT chipsets
- 1-4MB dual RAM socket
- 1-4MB module RAM socket on board
- 640KB-384KB memory relocation
- Three 8 BIT expansion slots
- Five 16 BIT expansion slots
- Memory expansion to 8MB
- Supports EMS 4.0
- Page Interleave Technology
- BIOS: AMI or PHOENIX
- Hardware and keyboard switchable Clock Speed
- LED speed display
- Power Good Signal on board
- Baby size main board
- **16MHz**

X18090.....$700

- **20MHz**

X18092.....$895

MOUSE

QUICK MOUSE MICROSOFT* COMPATIBLE

- Auto-selection and auto-transfer between mouse system PC mouse mode and Microsoft serial mouse mode
- Microsoft Serial Mouse and Mouse System compatible
- Super high tracking speed: 600mm/sec
- Super high resolution: 200 DPI (0.12mm/dot)
- Silicon rubber coated ball
- Optical rotary encoder

X19955.....$94.95

ROD IRVING ELECTRONICS

Please quote this advertisement for the prices listed for this month.

SYDNEY: 74 Parramatta Rd.
Stanmore 2048
Phone: (02) 519 3134
Fax: (02) 519 3868

MELBOURNE: 48 A'Beckett St
Phone: (03) 663 6151

NORTHCOTE: 425 High St.
Phone: (03) 489 8866

BRISBANE:
(V.C.R Computer Services)
647 Lutwyche Rd. Lutwyche.
Phone: (07) 857 5617

MAIL ORDER & CORRESPONDENCE:
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Order Hotline: 008 33 5757
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STRICTLY ORDERS ONLY

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$100 +	$7.50

The above postage rates are for basic postage only. Road Freight, bulky and fragile items will be charged at different rates.

Errors and omissions excepted. Prices and specifications subject to change.

ROD IRVING ELECTRONICS

LARRY LEWIS

File compression tools

USING A LIBRARY tool for storing multiple files in one 'library file' dates back to the good old CP/M days. The theory was that, since the number of files you could have in an area was limited, you needed a way to keep those useful files handy. If you can't remember good old CP/M, there were no directories to store related files, and the only equivalent was user numbers which were cumbersome.

Then, added to storing multiple files inside the library file, the library management program would also compress your file. This was generally done using a mechanism called Huffman compression (which was named after the creator of the method of doing the compression). Not only did you reduce the number of directory entries, but you also saved disk space. What a boon to computer users!

When the MS-Dos style PCs started showing up, the good old CP/M tools were the first ones that came across and were used to save valuable disk space. Then a legend was brought forth from a company called SEA (Systems Enhancements Associates) called ARC, back in 1985, and it quickly became the standard file compression and archiving tool.

Up until last year, ARC was *the* file compression tool, and then all hell broke loose. The author of ARC sued the author of an ARC clone for breach of copyright. Whether one side was right or not is of no consequence now, but what happened was that the precious standard disappeared as people started taking side in the great ARC wars of 1988.

Although ARC is still alive and kicking, it can no longer be called *the* standard because there are just too many other file compression methods around now. The problem is not lack of freedom of choice, but rather the fact that for users, no one tool can be used with all archive files. Almost all of the new tools are incompatible with each other. This means that in order to be able to unpack any library archive, you need to acquire a plethora of tools to assist you in the management of your files.

Which tool to use

'WHICH TOOL do I use?' you ask. Well, for the files that you want to compress for your own use there is a choice to be made, and it's not just a simple matter of picking one. There have been plenty of articles comparing the relative worth of one compression method over another. The good old speed comparisons, compaction rates, and even a pretty screen index.

No way do I want to enter the debate on those grounds. If you want to save the maximum disk space LHARC appears the best, but it can be painfully slow. If you want speed and good compression ZIP appears to be the best of both worlds. However, if you want to be able to move the compressed file from one machine to another (with different operating systems and so on) then the choices are ARC (yep – the 'first') as it is on most machines, or ZOO which is almost everywhere and anywhere (Zoo is the Unix created compression tool).

What about the files that you are downloading? Each BBS seems to have settled on a file compression tool of its own choice. The operator of the board should have the tool available for you to unpack the files that are on-line for downloading.

LHARC to SHEZ

LHARC IS FROM Japan and is generally called LH-113C.COM and creates files with an extension of LZH. PKZIP is currently called PKZ102.EXE and creates files with an extension of ZIP. ZOO (called ZOO201.EXE), PAK (called PAK210.EXE), and ARC (called ARC602.EXE) all create files with an extension of ZOO, PAK, and ARC respectively.

SPAZ is not a file compression method, what it does is look at a file and determine what sort of archive it is, and depending on the compression method, it then calls the appropriate tool to unpack the file. SPAZ is currently being called SPAZ 120.LZH.

SHEZ is another useful tool that acts as a visual shell for browsing and extracting archives. It uses the actual tools themselves to unpack and manage the libraries. The current version also has an option to allow it to scan an archive for possible virus infections using the McFee and Associates virus scanner. SHEZ is currently called SHEZ48.ZIP.

All of this is a bit daunting, especially for new comers, and downloading all of these tools will make a big hole in your time allowed on systems. In fact, some systems will class you as a leech for simply trying, and downloading the tools necessary to download the program you want (Catch-22 hey!).

Complete BBS Registry listing

WE PUBLISH THE COMPLETE listing for the ACT and New South Wales in July, October, January and April; the listing for Victoria, Tasmania and the Northern Territory in August, November, February and May; and South Australia, Western Australia and Queensland in September, December, June and March.

If you want all of these tools for your collection and blanch at downloading them or paying heaps for getting them from one of the library places, send me $10 (no cash) and I will copy the current versions of all of the above files to disk and post them back. Include whether you want 360K, 1.2Mb 5¼ inch disks, or a 720K 3½ inch disk when you send in your request. Please note that the programs are shareware style, and if you wish to use them you will need to comply with the user licenses included with the files. Write to: Prophet Bulletin Board, Archive Files, PO Box E41, Emerton NSW 2770. □

Primary electronic collection points

ACT – PC Exchange RIBM (062) 58 1406

NSW – Prophet TBBS (02) 628 5222

Vic. – Custom Programming Opus (03) 848 3331

Qld. – AMPAK Opus/PRBBS (07) 263 7070

SA – Oracle PC-Network (08) 260 6222

WA – Nemo Multiple BBS RAPL (09) 370 1855

Tas. – Hobart Users Bulletin Board (002) 43 5041

BBS Listing 8911

Release: 8911 Sat 4 Nov
New systems: 19
Online: 4
Unknown: 4
Offline: 17
Name Change: 6
Amended: 32
TOTAL Systems: 370

AUSTRALIAN CAPITAL TERRITORY

Ghost of Opus
Sysop: Scott Furry
Phone: (062) 58-7160
FIDOnet: 3:620/240
Baud: V21 V22 V22bis B103 B212
Access: Public
Computer: IBM XT Clone
DOS: MS DOS
BBSoftware: QuickBBS

MICSIG Fido
Phone: (062) 85-1026
Baud: V21 V22 V22bis V23
Access: Public
BBSoftware: Fido

PC Exchange Opus
Sysop: Phil Harding
Phone: (062) 58-1406
FIDOnet: 3:620/244
Baud: V21 V22 V22bis V23
Access: Mem LVA

PCUG Bulletin Board
Sysop: Alan Salmon
Phone: (062) 59-1244
FIDOnet: 3:620/243
Baud: V21 V22 V22bis V23
Access: Mem LVA
Computer: IBM AT
DOS: PC DOS
BBSoftware: Opus

Percom BBS
Sysop: Alex Reutt
Phone: (062) 81-3119
FIDOnet: 3:620/247.0
Baud: V21 V22
Access: Public
Hours: Daily: 2100 - 0700
Computer: IBM XT Clone
DOS: MS DOS
BBSoftware: Opus

The Capital BBS (CUG [ACT] Inc.)
Sysop: Basil Chupin
Phone: (062) 81-0847
FIDOnet: 3:620/241
Baud: V21 V22 V22bis V23
Access: Mem LVA
BBSoftware: Lynx

NEW SOUTH WALES

1st Xanadu
Sysop: Bob Jones
Phone: (02) 622-9591
FIDOnet: 3:713/608
Baud: V21 V22 V22bis
Access: Public
Hours: Weekdays: 2200 - 1700Weekends: 2200 - 0900
Computer: ASI 009
DOS: MS DOS
BBSoftware: QuickBBS

2000 and Beyond QuickBBS
Sysop: Greg Kuhnert
Phone: (02) 544-7123
FIDOnet: 3:712/513
Baud: V21 V22 V22bis V23 B212
Access: Mem Reg LVA
Computer: IBM XT Clone
DOS: MS DOS
BBSoftware: QuickBBS

500cc Formula One Amiga BBS
Sysop: Dino
Phone: (02) 550-6858
Baud: V21 V22 V22bis V23 B103
Access: Reg
Computer: Amiga 2000
DOS: AmigaDOS
BBSoftware: BBS-PC!

A Southern Rendezvous
Sysop: Kevin Withnall
Phone: (042) 26-3382
FIDOnet: 3:712/206
Baud: V21 V22 V22bis V23
Access: Mem LVA
Computer: IBM AT Clone
DOS: MS DOS
BBSoftware: Opus

ABCOM-dataLINK
Sysop: Ben Sharif
Phone: (047) 36-4165
FIDOnet: 3:713/304
Baud: V21 V22 V22bis V23
Access: Mem Reg VA
Computer: IBM AT Clone
DOS: PC DOS
BBSoftware: QuickBBS

ACE (NSW) PRACS
Sysop: Larry O'Keefe
Phone: (02) 529-2059
Baud: V21 V22 V22bis V23 B103
Access: Mem Reg LVA
Computer: Atari
DOS: TOS
BBSoftware: FoRem

Aftermath BBS
Sysop: Ron & Andrew Clark
Phone: (02) 872-5520
FIDOnet: 3:711/804
Baud: V21 V22 V22bis V23 B103
Access: Mem VA
Computer: IBM AT Clone
DOS: MS DOS
BBSoftware: Opus

AmigaMan
Sysop: Ron Carruthers
Phone: (047) 58-8006
Baud: V21 V22 V22bis V23
Access: Mem Reg LVA
Computer: Amiga 1000
DOS: AmigaDOS
BBSoftware: BBS-PC!

Amstrad ABBS
Sysop: Riccay Schmahl
Phone: (02) 981-2966
Baud: V21 V22 V22bis V23
Access: Reg VA
Computer: IBM 386 Clone
DOS: MS DOS
BBSoftware: Opus

Apolloline Australia BBS
Sysop: Richard Heppell
Phone: (02) 869-8349
Baud: V21 V22 V22bis V23
Access: Mem Reg VA
Computer: Macintosh
DOS: HFS
BBSoftware: Red Ryder Host

Apple Users Group - Apple // BBS
Sysop: Cameron Brawn
Phone: (02) 449-7798
Baud: V21 V22 V22bis V23
Access: Mem LVA
Computer: Apple //e
DOS: ProDOS
BBSoftware: Proboard //

Arrow KBBS
Sysop: Mark Sinclair
Phone: (02) 451-2660
Baud: V21 V22 V23 B103 B212
Access: Mem Reg VA
Computer: C-64
BBSoftware: KBBS

Atari ST Users Club
Sysop: Andrew Brown
Phone: (02) 709-4038
Baud: V21 V22 V22bis V23
Access: Public
Hours: Weekdays: 1900 - 0700-Weekends: 24 Hours
Computer: IBM PS/2
DOS: MS DOS
BBSoftware: Minihost

Atlantis
Sysop: Brett Selwood & Mark Farnan
Phone: (02) 534-6944
FIDOnet: 3:712/504
Baud: V21 V22 V22bis V23 PEP
Access: Mem Reg LVA
Computer: IBM AT Clone
DOS: MS DOS
BBSoftware: Opus / QuickBBS

AUG*MAC*BBS
Sysop: Richard Kempe
Phone: (02) 439-6142
Baud: V21 V22 V22bis V23
Access: Mem LVA
Computer: Macintosh
DOS: HFS
BBSoftware: Red Ryder Host

AUGUR TBBS
Sysop: Mark James
Phone: (02) 311-3052
FIDOnet: 3:712/302
Baud: V22 V22bis V23
Access: Reg VA
Computer: IBM XT Clone
DOS: PC DOS
BBSoftware: TBBS

Australian Pick User's BBS
Sysop: Kurt Johannessen
Phone: (02) 631-8603
FIDOnet: 3:713/610
Baud: V21 V22 V22bis HST
Access: Reg VA
Computer: IBM XT Clone
DOS: MS DOS
BBSoftware: PCBoard

Avalon BBS
Sysop: Lance Lyon
Phone: (02) 319-1793
FIDOnet: 3:712/313
Baud: V21 V22 V22bis V23
Access: Public
Computer: IBM XT Clone
DOS: PC DOS
BBSoftware: QuickBBS

Beauford BBS
Sysop: Roger Cooper
Phone: (047) 58-6542
Baud: V21 V22 V22bis V23
Access: Public
Computer: IBM XT Clone
BBSoftware: QuickBBS

Bill's BBS
Sysop: Bill Mastro
Phone: (049) 45-9166
Baud: V21 V22 V23
Access: Reg
Computer: Apple //e Clone
DOS: ProDOS
BBSoftware: GBBS Pro

Bit-Board
Sysop: John Hamill
Phone: (02) 411-6375
FIDOnet: 3:711/404
Baud: V21 V22 V22bis V23
Access: Public
Computer: Everex AT
DOS: MS DOS
BBSoftware: Opus

Blackboard BBS
Sysop: Will Black & Shane Andersen
Phone: (02) 525-6970
Baud: V21 V22 V22bis V23 B103 B212
Access: Reg VA
Computer: IBM XT Clone
DOS: MS DOS
BBSoftware: QuickBBS

Books BBS
Sysop: Jon Ruwolt & Chris Ruwoldt
Phone: (02) 281-4791
Baud: V21 V22 V22bis V23
Computer: IBM XT Clone
DOS: MS DOS
BBSoftware: Opus

Cavity
Sysop: Don Cunningham
Phone: (02) 606-9687
FIDOnet: 3:713/611
Baud: V21 V22 V22bis
Access: Mem Reg VA
Computer: Profound XT Turbo
DOS: MS DOS
BBSoftware: QuickBBS

Club Amiga BBS
Sysop: Ross Kellaway
Phone: (02) 521-6338
FIDOnet: 3:712/511
Baud: V21 V22 V22bis V23
Access: Mem VA
Computer: IBM XT Clone
DOS: MS DOS
BBSoftware: QuickBBS

Club Mac Remote Maccess System
Sysop: Ian MacPherson
Phone: (02) 906-3455

Baud: V22 V22bis V23
Access: Mem LVA
Computer: Macintosh
DOS: HFS
BBSoftware: Red Ryder Host

Club-80 RTRS
Sysop: Michael Cooper
Phone: (02) 332-2494
Baud: V21 V22 V22bis V23 B103
Access: Mem VA
Computer: TRS80 Model 4
DOS: LDOS

Coastal BBS
Sysop: Kevin Mann
Phone: (043) 23-2275
FIDOnet: 3:711/430
Baud: V22 V22bis PEP
Access: Public
Computer: IBM AT Clone
DOS: MS DOS
BBSoftware: Opus

Coastal Communications
Sysop: Chris Patten
Phone: (02) 977-6869
FIDOnet: 3:714/906
Baud: V21 V22 V22bis V23
Access: Mem LVA
Computer: IBM AT Clone
DOS: MS DOS
BBSoftware: QuickBBS

Comet C-64 BBS
Sysop: Eric Davis
Phone: (02) 599-7342
Baud: V21 V23
Access: Mem VA
Computer: C-64
BBSoftware: Comet
Note: Requires UltraTerm or Palette on C-64

Commodore Amiga BBS
Sysop: Paul Bourke and Graham Lee
Phone: (02) 664-2334
FIDOnet: 3:712/629
Baud: V21 V22 V22bis V23 B103
Access: Mem Reg VA
Computer: IBM XT Clone
DOS: MS DOS
BBSoftware: QuickBBS

Commodore Pursuit TBBS
Sysop: Warren Hillsdon
Phone: (02) 522-9144
FIDOnet: 3:712/512
Baud: V21 V22 V22bis V23 B212
Access: Reg LVA
Computer: IBM AT Clone
DOS: MS DOS
BBSoftware: TBBS

Compax Computers
Sysop: Alex Sardo
Phone: (02) 890-1059
FIDOnet: 3:713/601
Baud: V21 V22 V22bis V23
Access: Mem LVA
Computer: IBM XT Clone
DOS: MS DOS
BBSoftware: Opus

Computrol
Sysop: Bob Spence
Phone: (02) 489-6848
GTnet: 302/004
Baud: V22 V22bis B212
Access: Mem Reg VA
Computer: IBM AT Clone
DOS: MS DOS
BBSoftware: GTPower

Conquest BBS
Sysop: Andrew Fryer
Phone: (02) 899-4093
Baud: V21 V22 V23
Access: Public
Computer: C-64
BBSoftware: KBBS

DefCom BBS
Sysop: Jere Lawrence
Phone: (02) 764-3949
Baud: V21 V22 V22bis
Access: Public
Hours: Daily: 2100 - 0800
Computer: Atari 1040ST
DOS: TOS
BBSoftware: QuickBBS/ST

Delta Net
Sysop: Geoff Arthur
Phone: (02) 457-8281
FIDOnet: 3:711/415
Baud: V21 V22 V22bis V23 B103
Access: Reg LVA
Computer: IBM 386 Clone
DOS: PC DOS
BBSoftware: QuickBBS

Dick Smith Electronics BBS
Phone: (02) 887-2276
Baud: V21 V22
Access: Reg
Computer: Multitech PC-500
DOS: MS DOS
BBSoftware: Opus

Display Systems Australia BBS
Sysop: Michael Butler
Phone: (02) 690-1450
FIDOnet: 3:712/515
Baud: V21 V22 V22bis B103 B212 PEP
Access: Reg VA
Computer: IBM PC/XT Clone
DOS: MS DOS
BBSoftware: QuickBBS

Down Under KBBS
Sysop: Glen Myles
Phone: (02) 674-6647
Baud: V21
Access: Mem VA
Computer: C-64
BBSoftware: KBBS

Eagle One BBS
Sysop: Terry Harvey
Phone: (02) 745-3190
FIDOnet: 3:712/704
Baud: V21 V22 V22bis PEP
Access: Mem Reg VA
Computer: IBM AT Clone
DOS: MS DOS
BBSoftware: Opus

Eagle's Nest BBS
Sysop: Philip Dean
Phone: (02) 451-0535
FIDOnet: 3:714/409
Baud: V22 V22bis B103 B212
Access: Mem Reg VA
Computer: IBM AT Clone
DOS: MS DOS
BBSoftware: QuickBBS

Easy Access GBBS
Sysop: -=*The Virus*=-
Phone: (046) 28-5114
Baud: V21 V22 V22bis V23
Computer: Apple //e
DOS: ProDOS
BBSoftware: GBBS

Eden
Sysop: David Luong
Phone: (02) 699-9342
FIDOnet: 3:712/631
Baud: V22 V22bis B212
Access: Reg VA
Computer: IBM AT Clone
DOS: MS DOS
BBSoftware: Opus

Food For Thought
Sysop: Steve Thompson
Phone: (02) 683-6093
GTnet: 302/006
Baud: V21 V22 V22bis V23
Access: Public
Computer: IBM AT Clone
DOS: MS DOS
BBSoftware: GTPower

GALEN BBS
Sysop: Paul Purvis
Phone: (02) 680-4897
FIDOnet: 3:713/609
Baud: V21 V22 V22bis V23
Access: Reg VA
Computer: IBM AT Clone
DOS: MS DOS
BBSoftware: QuickBBS

Helping Hand
Sysop: Dave Hatch
Phone: (02) 872-3571
FIDOnet: 3:711/807
Baud: V22 V22bis PEP
Access: Reg VA
Computer: AT Clone
DOS: PC DOS
BBSoftware: Opus

HighTech
Sysop: Ross Wheeler
Phone: (060) 25-1813
FIDOnet: 3:712/201
Baud: V21 V22 V22bis V23 B103 B212 PEP
Access: Reg LVA
Computer: IBM AT Clone
DOS: PC DOS
BBSoftware: Opus

Hot-Line
Sysop: Nick Harvey
Phone: (02) 488-9375
Baud: V21 V22 V22bis
Access: Public
Computer: IBM XT Clone
DOS: MS DOS
BBSoftware: GTPower

Hunter Schools' BBS
Sysop: Matthew Taylor
Phone: (049) 69-2851
FIDOnet: 3:711/493
Baud: V21 V22 V22bis V23
Access: Public
Computer: IBM XT Clone
DOS: MS DOS
BBSoftware: QuickBBS

Illawarra BBS
Sysop: John Simon
Phone: (042) 61-8230
FIDOnet: 3:712/518
Baud: V21 V22 V22bis V23 B103
Access: Reg VA
Computer: XT Clone
BBSoftware: Opus

Integra TEX
Sysop: Kevin Leong
Phone: (02) 746-1109
FIDOnet: 3:712/703
Baud: V21 V22 V22bis V23
Access: Public
Computer: IBM AT Clone
DOS: PC DOS
BBSoftware: QuickBBS

Inter City BBS
Sysop: Jodi Jackson
Phone: (02) 319-0925
FIDOnet: 3:712/208
Baud: V21 V22 V22bis
Access: Reg LVA
Computer: IBM XT Clone
DOS: MS DOS
BBSoftware: QuickBBS

Intersoft BBS
Sysop: Craig Heading
Phone: (02) 476-2391
FIDOnet: 3:711/411
Baud: V22 V22bis V32
Access: Mem Reg LVA
Computer: Tandy 3000
DOS: MS DOS
BBSoftware: Opus

K.K.K BBS
Sysop: Jim Lynch
Phone: (02) 418-6005
FIDOnet: 3:711/416
Baud: V21 V22 V22bis V23
Access: Reg
BBSoftware: TBBS

Lodestone BBS
Sysop: Ian McWhirter
Phone: (02) 456-3264
FIDOnet: 3:711/407
Baud: V22 V22bis B103 B212 PEP
Access: Reg
Computer: IBM XT Clone
DOS: MS DOS
BBSoftware: Opus

M A X's BBS
Sysop: Max
Phone: (02) 908-3346
Baud: V22 V22bis B103 B212
Access: Reg
Computer: Amiga 500
DOS: AmigaDOS
BBSoftware: BBS-PC!

Macarthur BBS
Sysop: Peter Degotardi
Phone: (046) 28-1499
Baud: V21 V22 V22bis V23
Access: Public
Computer: Osborne XT
DOS: MS DOS
BBSoftware: Opus

MAD BBS
Sysop: Martin Hopley
Phone: (02) 579-2029
FIDOnet: 3:712/516

Baud: V21 V22 V22bis V23 B212
Access: Public
Hours: Daily: 2200 - 0700
Computer: IBM XT Clone
DOS: PC DOS
BBSoftware: QuickBBS

Mail Dispatch
Sysop: Matthew Wood & Andrew Avery
Phone: (02) 969-5861
FIDOnet: 3:711/905
Baud: V21 V22 V22bis V23
Access: Mem Reg
Hours: Daily: 1600 - 0700
Computer: IBM XT Clone
DOS: MS DOS
BBSoftware: QuickBBS

Manly BBS
Sysop: Chris Patten
Phone: (02) 977-6820
Baud: V21 V22 V23
Access: Reg VA
Note: Requires Ultraterm or Palette on C-64

MDL Citadel
Sysop: Lindsay & Karen Gorrie
Phone: (02) 796-7145
Baud: V21
Access: Public
Computer: S-100
DOS: CP/M
BBSoftware: Citadel

MEGA Technology TBBS
Sysop: Stan White
Phone: (049) 61-6803
FIDOnet: 3:711/490
Baud: V21 V22 V22bis V23
Access: Mem VA
Computer: IBM AT Clone
DOS: MS DOS
BBSoftware: TBBS

MicroBASE BBS
Sysop: Dave Whiteman
Phone: (047) 35-2415
FIDOnet: 3:713/305
Baud: V21 V22 V22bis V23
Access: Mem VA
Computer: IBM XT Clone
DOS: MS DOS
BBSoftware: QuickBBS

Milliway's
Sysop: David Coucke
Phone: (02) 357-7027
FIDOnet: 3:712/306
Baud: V21 V22 V22bis V23 B103
Access: Mem Reg VA
Computer: Amiga 1000
DOS: AmigaDOS
BBSoftware: QuickBBS

Moebius Trip
Sysop: David Butler
Phone: (02) 439-7072
FIDOnet: 3:711/408
Access: Mem VA
BBSoftware: Opus

My Other Half
Sysop: Phil Young
Phone: (02) 740-6246
FIDOnet: 3:712/517
Baud: V21 V22 V22bis V23
Access: Public
BBSoftware: Opus

New Frontiers CBCS
Sysop: Howard Pew
Phone: (046) 28-0842
FIDOnet: 3:713/613
Baud: V22 V22bis B103 B212 PEP
Access: Reg VA
Computer: IBM 386/16 Clone
DOS: MS DOS
BBSoftware: Opus

Newcastle Micro Club BBS
Sysop: Tony Nicholson
Phone: (049) 68-5289
Baud: V21 V22 V22bis V23
Access: Mem VA
Hours: Weekdays: 1700 - 0830- Weekends: 24 Hours
Computer: ASI XT
DOS: MS DOS
BBSoftware: QuickBBS

Omega Board BBS
Sysop: Paul Speirs & Linda Piltz
Phone: (02) 792-1526
FIDOnet: 3:712/711
Baud: V21 V22 V22bis B103 B212
Access: Reg
Computer: IBM AT
DOS: PC DOS
BBSoftware: QuickBBS

Opus Info Under
Sysop: Bill Bolton
Phone: (02) 449-2618
FIDOnet: 3:3/113
Baud: V22 V22bis PEP
Access: File Server
Note: Software support system for FidoNetSysOps - File Request ONLY

Out of This World BBS
Sysop: Adam Todd
Phone: (02) 477-6502
Baud: V21 V22 V22bis
Access: Reg VA
Computer: IBM 386 Clone
DOS: MS DOS
BBSoftware: Searchlight

Outdoors Education
Sysop: Mel Lee
Phone: (046) 66-9881
Baud: V21 V22 V22bis
Access: Reg VA
Computer: IBM AT Clone
DOS: MS DOS
BBSoftware: GTPower

Palantir C-64 BBS
Sysop: Steve Sharp
Phone: (060) 40-1284
Baud: V21 V22 V22bis V23 B103
Access: Reg VA
Computer: C-64
BBSoftware: Punter

Paragon Bulletin Board
Sysop: Jennifer Allen
Phone: (02) 597-7477
FIDOnet: 3:712/502
Baud: V21 V22 V22bis V23
Access: Reg VA
Computer: IBM XT Clone
DOS: MS DOS
BBSoftware: TBBS

PC Users Group - Compaq Board
Sysop: Bruce Edney
Phone: (02) 540-1842
FIDOnet: 3:712/505
Baud: V21 V22 V22bis V23
Access: Mem Reg LVA
Computer: Compaq
DOS: PC DOS
BBSoftware: Opus

PC Users Group - IBM Board
Sysop: John Clarke
Phone: (02) 724-6813
Baud: V21 V22 V22bis V23
Access: Reg LVA
Computer: IBM AT
DOS: PC DOS
BBSoftware: Opus

PC Users Group - Microcomp Board
Sysop: Chris Kelly
Phone: (02) 698-8769
Baud: V21 V22 V22bis V23
Access: Mem Reg LVA
Computer: IBM PC
DOS: PC DOS
BBSoftware: Opus

Phantom Connection BBS
Sysop: Bob James
Phone: (02) 399-7716
FIDOnet: 3:712/311
Baud: V21 V22 V22bis B103 B212
Access: Public
Computer: IBM XT Clone
DOS: MS DOS
BBSoftware: QuickBBS

Poet's Dilemma
Sysop: John Della-Torre
Phone: (02) 804-6412
GTnet: 302/000
Baud: V22 V22bis HST
Access: Mem Reg LVA
Computer: IBM 386 Clone
DOS: PC DOS
BBSoftware: GTPower

Prophet TBBS
Sysop: Larry Lewis
Phone: (02) 628-5222
FIDOnet: 3:713/600
Baud: V21 V22 V22bis V23
Access: Mem Reg VA
Computer: IBM AT Clone
DOS: PC DOS
BBSoftware: TBBS

RCOM C-64 BBS
Sysop: Simon Finch
Phone: (02) 667-1930
Baud: V21 V22 V23 V23ORG B103
Access: Reg VA
Computer: C-64
BBSoftware: RCOM
Note: Requires UlatraTerm or Palette on C-64

Riverina BBS
Sysop: Craig Sinclair
Phone: (069) 67-2277
FIDOnet: 3:712/420
Baud: V21 V22 V22bis V23
Access: Reg LVA
Hours: Daily: 2000 - 0800
Computer: IBM XT Clone
DOS: MS DOS
BBSoftware: Opus

rti's Pinkboard
Sysop: Laurence Singer
Phone: (02) 264-8313
Baud: V21 V22 V22bis V23
Access: Mem VA
Computer: IBM XT Clone
DOS: MS DOS
BBSoftware: Opus

RUNX
Sysop: Mark Webster
Phone: (02) 487-2533
Baud: V21 V22 V22bis V23
Access: Mem LVA
Computer: IBM 386 Clone
DOS: Xenix

SBA BBS
Sysop: Bob Wilson
Phone: (02) 872-6697
FIDOnet: 3:711/406
Baud: V22bis PEP
Access: Reg LVA
Computer: IBM AT
DOS: PC DOS
BBSoftware: Opus

Sci-Fi BBS
Sysop: Greg Hope
Phone: (02) 646-4865
Baud: V21 V22 V23
Access: Public
Computer: TI 99/4A
BBSoftware: Ti-Net

Sentry
Sysop: Trev Roydhouse
Phone: (02) 428-4687
FIDOnet: 3:711/401
Baud: V21 V22 V22bis V23
Access: Mem VA
Computer: IBM AT Clone
BBSoftware: Opus

Shortwave Possums
Sysop: Patrick Mcdonald
Phone: (02) 651-3055
FIDOnet: 3:713/605
Baud: V21 V22 V22bis V23
Access: Public
Computer: IBM XT Clone
DOS: MS DOS
BBSoftware: Opus

Sky-Line
Sysop: Phil Mackay
Phone: (02) 872-6159
FIDOnet: 3:711/801
Baud: V21 V22 V22bis V23 B103 B212
Access: Reg
Computer: IBM XT Clone
DOS: MS DOS
BBSoftware: QuickBBS

Small Business
Sysop: Geoff Bilborough
Phone: (049) 50-4211
FIDOnet: 3:711/491
Baud: V21 V22 V22bis V23
Access: Public
Computer: IBM AT Clone
DOS: MS DOS
BBSoftware: QuickBBS

SMUG Opus
Sysop: Stephen Thompson
Phone: (02) 476-6396
FIDOnet: 3:711/417

Baud: V21 V22 V22bis V23
Access: Mem Reg VA
Computer: IBM XT Clone
DOS: MS DOS
BBSoftware: Opus

Software Connection
Sysop: Graeme Nichols
Phone: (02) 975-1006
FIDOnet: 3:714/404
Baud: V21 V22 V22bis V32 B103 B212 HST
Access: Mem Reg VA
Computer: IBM XT Clone
DOS: PC DOS
BBSoftware: Opus

Software Tools
Sysop: Bill Bolton
Phone: (02) 449-9477
FIDOnet: 3:711/403
Baud: V22bis PEP
Access: Reg VA
Computer: Sharp 7501 AT
DOS: PC DOS
BBSoftware: Opus

Sorcerer Users Group
Sysop: John Cepak
Phone: (02) 626-8020
FIDOnet: 3:713/607
Baud: V22 V22bis B103
Access: Mem VA
BBSoftware: Opus

Sorcim microS
Sysop: John Caine
Phone: (065) 59-4537
FIDOnet: 3:711/405
Baud: V21 V22 V22bis V23 PEP
Access: Public
Hours: Daily: 2100 - 0800
BBSoftware: Lynx

Stardust BBS
Sysop: Orbit
Phone: (02) 645-3361
Baud: V21 V22 V23 B103 B212
Access: Mem Reg LVA
Computer: C-64
BBSoftware: KBBS

Sydney CAE BBS
Sysop: Geoff Shearsby
Phone: (02) 660-8272
FIDOnet: 3:712/628
Baud: V21 V22 V22bis
Access: Reg LVA
Computer: IBM XT
DOS: PC DOS
BBSoftware: Opus

Sydney Data Exchange
Sysop: Roger Stockburger
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FIDOnet: 3:711/418
Baud: V21 V22 V22bis
Access: Public
Computer: Macpro AT
DOS: PC DOS
BBSoftware: Opus

Sydney Information Xchange
Sysop: Lawrence Gould
Phone: (02) 519-6681
GTnet: 302/008
Baud: V21 V22 V22bis
Access: Reg VA
Computer: IBM AT Clone
DOS: MS DOS
BBSoftware: GTPower

Syncopation
Sysop: John Morrison
Phone: (02) 907-9603
FIDOnet: 3:712/513.5
Baud: V21 V22 V22bis V23 B212
Access: Public
Computer: IBM XT Clone
DOS: MS DOS
BBSoftware: QuickBBS

Tachyonics
Sysop: Richard Lenz
Phone: (02) 438-2682
Baud: V21 V22
Access: Reg VA
BBSoftware: Fido

Talking Heads BBS
Sysop: Jim Caldwell
Phone: (02) 399-7332
Baud: V21 V22 V22bis V23
Hours: Weekdays: 1430 - 0730- Weekends: 24 Hours
Computer: Amiga500
DOS: AmigaDOS
BBSoftware: BBS-PC!

Tech Exchange
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Phone: (02) 712-2282
FIDOnet: 3:712/708
Baud: V21 V22 V22bis V23 B103
Access: Reg LVA
Computer: IBM AT Clone
DOS: MS DOS
BBSoftware: Opus

TeleInfo Australia
Sysop: Ross Delaforce
Phone: (02) 975-1099
FIDOnet: 3:714/407
Baud: V21 V22 V22bis V23 B103
Access: Mem VA
Computer: IBM 386 Clone
DOS: MS DOS
BBSoftware: TBBS

Terminal Madness QuickBBS
Sysop: Sean Rodden
Phone: (02) 975-2049
FIDOnet: 3:714/406
Baud: V21 V22 V22bis V23 B103
Access: Mem Reg LVA
Computer: IBM XT Clone
DOS: MS DOS
BBSoftware: QuickBBS

Texpac Electronic Magazine
Phone: (02) 319-1009
Baud: V21 V22 V22bis V23 B103
Access: Mem
Computer: TI 99/4A

The Arcade Parlour
Sysop: Greg Cockett
Phone: (02) 809-6901
GTnet: 302/007
Baud: V21 V22 V22bis
Access: Public
Computer: IBM AT Clone
DOS: MS DOS
BBSoftware: GTPower

The Black Hole
Sysop: Ken Thompson
Phone: (02) 719-8161
GTnet: 302/003
Baud: V21 V22 V22bis B103 B212 HST
Access: Mem Reg LVA
Computer: IBM 386 Clone
DOS: PC DOS
BBSoftware: GTPower

The Bush Telegraph
Sysop: Mark Kofahl
Phone: (02) 481-8410
GTnet: 302/012
Baud: V21 V22 V22bis
Access: Mem Reg LVA
Computer: IBM AT Clone
DOS: MS DOS
BBSoftware: GTPower

The Cabal Connection
Sysop: Ian Hunter
Phone: (02) 625-6055
FIDOnet: 3:713/612
Baud: V21 V22 V22bis V23
Access: Mem Reg
Computer: IBM XT Clone
DOS: MS DOS
BBSoftware: QuickBBS

The Dead Zone
Sysop: Mark Kelly
Phone: (02) 805-5517
Baud: V21 V22
Access: Public
Hours: Weekdays: 1800 - 0600- Weekends: 24 Hours
Computer: IBM AT Clone
DOS: PC DOS
BBSoftware: GTPower

The Ivory Tower
Sysop: Colin Leslie
Phone: (02) 523-9886
FIDOnet: 3:712/624
Baud: V21 V22 V22bis V23 B103
Access: Public
Computer: IBM XT Clone
DOS: MS DOS
BBSoftware: Opus

The Lost Tavern
Sysop: Sean Murphy
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FIDOnet: 3:714/902
Baud: V21 V22 V22bis V23
Computer: Blue Chip PC/XT
DOS: PC DOS
BBSoftware: Opus

The Network Connection BBS
Sysop: Tony Johnson
Phone: (02) 416-1078
FIDOnet: 3:711/802.7
Baud: V21 V22 V22bis
Access: Public
Computer: IBM PS/2
DOS: MS DOS
BBSoftware: OPUS

The Oops BBS
Sysop: Ian Object
Phone: (02) 626-5403
FIDOnet: 3:713/614
Baud: V21 V22 V22bis V23
Access: Mem VA
BBSoftware: Opus

The Red Dragon Inn
Sysop: Zorro & The Draftsman
Phone: (02) 708-6024
Baud: V21 V22
Access: Public
Computer: C-64
BBSoftware: KBBS

The Runway
Sysop: Colin Lean
Phone: (02) 569-5130
FIDOnet: 3:712/506
Baud: V22bis B103 B212 PEP
Access: Public
Computer: DeltaCom AT
DOS: MS DOS
BBSoftware: Opus

The Twilight Zone
Sysop: The Mystic Machine
Phone: (065) 72-3970
Baud: V21 V22 V23
Access: Reg LVA
Hours: Weekdays: 2100 - 0600- Weekends: 24 Hours
Computer: Apple //e
DOS: ProDOS
BBSoftware: GBBS Pro

Trantor
Sysop: Matthew Geier
Phone: (02) 545-1995
Baud: V21 V22 V22bis B103 B212
Access: Reg VA
Computer: MicroBee
DOS: CP/M
BBSoftware: ROS
Note: * RINGBACK *

Triops BBS
Sysop: Pdisk
Phone: (063) 62-9715
Baud: V21 V22 V23
Access: Public
Hours: Daily: 2100 - 1800
Computer: C-128
BBSoftware: KBBS

Ultimate-10 : The Ultimate BBS
Sysop: Ben Woo
Phone: (02) 484-4004
FIDOnet: 3:711/802
Baud: V21 V22 V22bis B103 B212
Access: Reg LVA
Computer: IBM AT Clone
DOS: MS DOS
BBSoftware: Opus

Wollongong Amiga BBS
Sysop: Peter Nicholson
Phone: (042) 27-3927
Baud: V21 V22 V22bis
Access: Reg VA
Hours: Weekdays: 1730 - 0800- Weekends: 24 Hours
Computer: Amiga 2000
DOS: AmigaDOS
BBSoftware: Atredes BBS

YABB
Sysop: Jonathan Chin
Phone: (02) 804-6837
FIDOnet: 3:711/803
Baud: V21 V22 V22bis V23 B103
Access: Reg VA
Computer: IBM XT Clone
DOS: MS DOS
BBSoftware: TBBS

Zeta MINIX users
Sysop: Nick Andrew
Phone: (02) 627-4177
FIDOnet: 3:713/602
Baud: V22 V22bis B103 B212
Access: Reg VA
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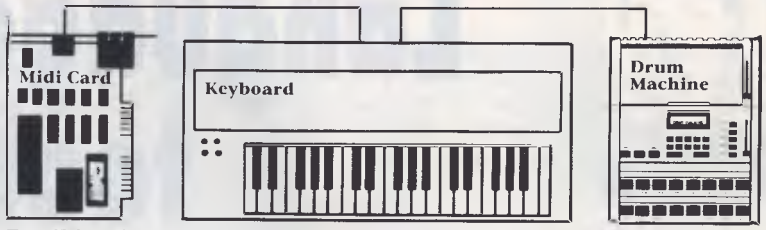

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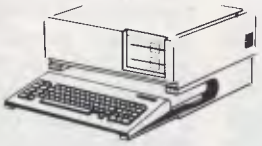

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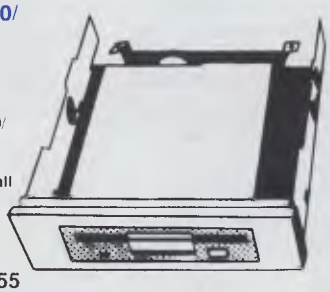

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ROD IRVING ELECTRONICS

GREGG FAULKNER

Languages and toolkits

THERE ARE TWO approaches to using a computer. Most of us come under the heading of end-Users. We use existing software packages or programs as tools to enable us to perform the tasks we are undertaking. For example, word processing, calculating with a spreadsheet, or storing and retrieving information with a database package.

We rarely stop and think about the coded instructions which are working inside the computer to enable us to use it so easily and productively. The truth of the matter is, of course, that most of us are not really interested in what is happening inside, so long as the package keeps going and providing the point-and-click interface we are comfortable with.

There are a large number of Amiga users to whom the nuts-and-bolts issues are of much more importance. These are the people who produce the applications programs for the rest of us to use. To applications developers, the Amiga has a very different appearance. Inside the Amiga is a very complex multitasking operating system with an extensive collection of operating system routines.

There is an indefinable quality, possessed by good programmers, which enables them to combine technical skill with the creative talents of an artist or musician. The results of this mixture are applications programs that wring the very best out of a computer. Like musicians, programmers need fine quality instruments with which to 'play' the computer. These computer 'instruments' are the programming languages developers.

Programmers use a variety of programming languages to develop packages for the Amiga. The C language has traditionally been the most popular because it allows the programmer intimate access to the Amiga operating system functions. It's a very powerful and flexible language, and used extensively in all levels of computing, from micro-computers through to mainframes. The down side of C is that it is a complex language to learn and requires constant practice to stay in good touch with it.

Pascal and Modula

ANOTHER LANGUAGE, called Pascal, is commonly used in tertiary institutions, and some secondary schools and colleges, to teach the concepts of structured programming. Pascal is generally regarded as an awkward language to use for application development, mainly because of its pedantic syntax. The author of Pascal went on to develop another language, using the best elements of Pascal and several other languages, and produced Modula. Further development resulted in the modern version, Modula-2.

Modula-2 is an excellent applications development language as it permits, the development of separate modules, and finally, the integration of these completed and tested modules into a finished package.

The down side of C is that it is a complex language to learn and requires constant practice to stay in good touch with.

Avant-garde Software, an American company, has developed a Modula-2 Software Construction Set which comprises a Modula-2 compiler, a very nice source level debugger, a simplified Amiga library, a C language library, and finally, an IFF and Amiga image library. This has to be the most complete implementation of any language I have ever seen in the microcomputer world. Laser Image Technologies is a commercial software development company in Melbourne. They have, therefore, a vested interest in the development languages they use. LIT's enthusiasm for Benchmark Modula-2 led them to take on the Australian distributorship. They believe it's the best available, and who am I to argue with them?

Benchmark Modula-2 is certainly a complete package. The disks are chock-a-block with sample source code, examples, and library routines. The manuals are well designed with careful and logical layout, comprehensive indexing and sensible structure. Avant-garde take pains to point out that Benchmark Modula-2 is not a Modula-2 training package. If you are new to the language, you will need a tutorial manual, and several are suggested. This package is intended for programmers who want a highly productive environment for application development.

My strongest impressions of the Benchmark Modula-2 Software Construction Set are the almost overwhelming volume of sample code and large volumes of library modules. Being able to call on these tried and tested routines can save many hours of wheel re-invention. As its name suggests, Modula-2 is purposely built as a modular programming language and building a program can sometimes feel a bit like assembling a jigsaw puzzle.

At $260 for the compiler, and $135 for each other set, the Benchmark Modula-2 Software Construction Set is competitively priced for a very high quality product. It's available from Laser Image Technologies, 248 Jasper Rd, McKinnon 3204 Vic, (03) 578 0868.

While we're on the subject of languages. Amiga owners who would like to get started in programming but see the task of learning C or Modula-2 as too daunting, there is now a viable alternative. GFA-Basic (available from your Commodore dealer) is the Basic language we Amiga owners have been waiting for.

GFA-Basic is an interpreted form of the Basic language that performs at a speed we have previously associated with compiled languages. I hate to have to admit it, but GFA-Basic's origins can be traced back to the Atari world. This unfortunate history has its brighter side as the Amiga release is version 3.0 of this package, a hopefully has had all the bugs worked out of it.

Whatever its past, GFA-Basic is a monumental improvement over the horrible environment provided by Amiga-Basic. This package opens to reveal a full (PAL) editing screen with most commonly used commands – Save, Load, Test, Run, and so on – displayed across the top of screen. These commands can be selected by

point-and-click with a mouse, or by using the F1 to F10 keys.

The editing process is a dream after the clumsy world of Amiga-Basic. Each line is verified by the interpreter when the return key is pressed. Indenting for loops is handled automatically, forcing even the most clumsy of us to produce code which is readable. Only a single command, with optional comment, is permitted on each source line. Finally, some of the nightmares of scrunched-up Basic are left behind us.

GFA-Basic provides a huge command set with an expanded set of loop commands such as DO ...UNTIL, DO ...WHILE, and LOOP ...UNTIL. Of course, all the best of previous structures like WHILE ...WEND, SELECT and CASE are also supported. Full bit manipulation is supported with BCLR, BSET, and rotation commands to satisfy the most fastidious programmer.

One of the nicest things I have ever seen implemented in a micro-computer language is the hypertext-like packing and unpacking of procedures. For example –

```
init
main_menu
```

```
PROCEDURE load
  FILESELECT "","Load File","Ok",
  file$
  IF NOT EXIST(file$)
    ALERT 0,"No file"
  ELSE
    OPEN "I",#1,file$
  ENDIF
RETURN
next menu
more code
```

would look like this after packing –

```
init
main_menu
> PROCEDURE load
next menu
more code
```

– with the > symbol indicating a packed procedure with lines hidden from view. This is a terrific idea and very useful for keeping lengthy programs down to a reasonable display length on screen while development is underway.

GFA-Basic allows the user to jump between program mode and immediate mode simply by pressing the Escape key – very convenient! In fact, there doesn't seem to be much that has been missed with this package. Even down to the options available with the Llist command.

Llist

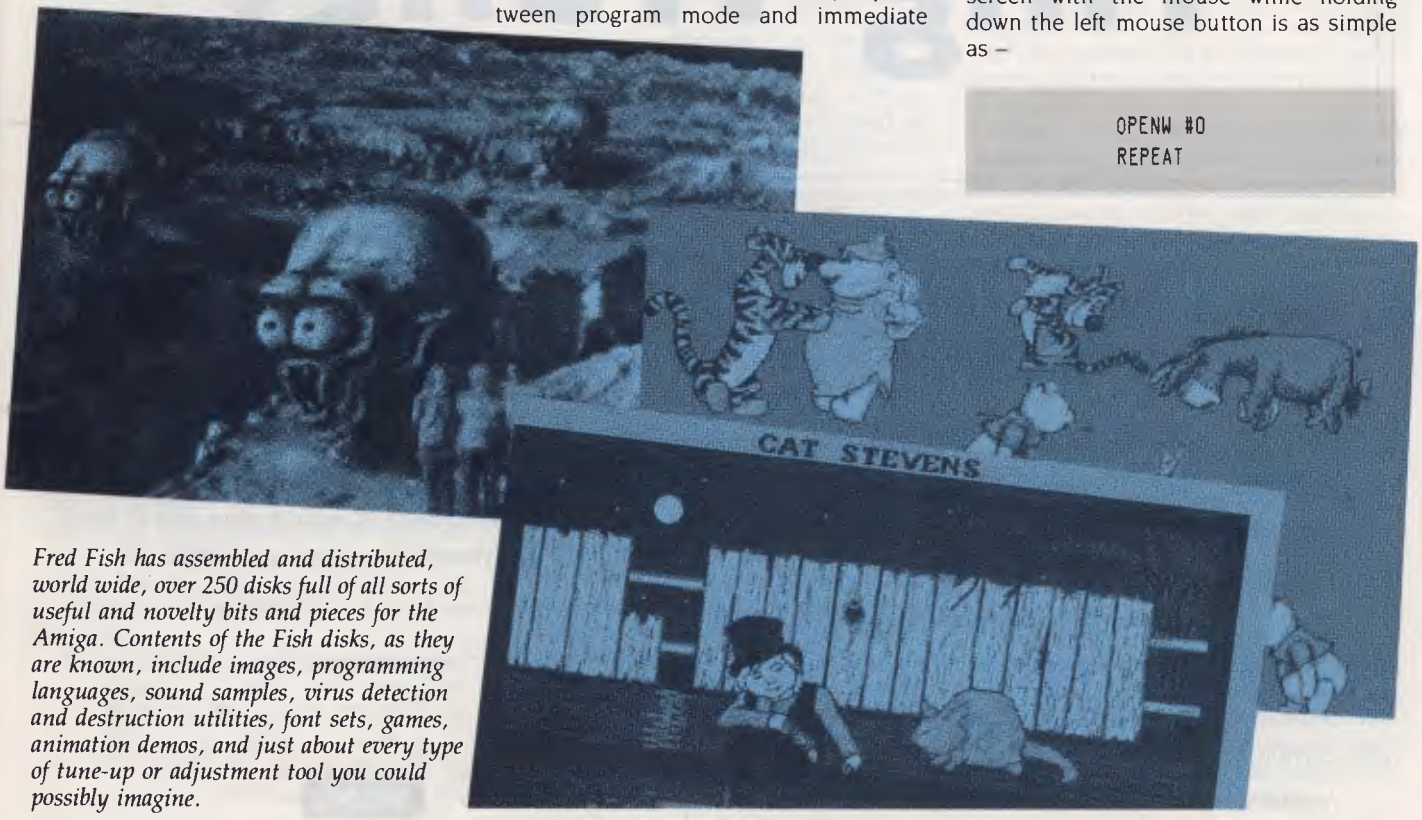
LLIST SENDS A program listing to the printer, but not before you have the option to change things such as maximum line and page lengths, page headers and footers, and even a one-time printer initialisation string. This is a really well thought out package, even down to the digital time display in the top right corner of screen to help devoted programmers remember mealtimes.

GFA-Basic works so well in the Amiga environment, using the machines facilities rather than fighting them as I feel Amiga-Basic does. For example, in GFA-Basic the old classic Hello World program comes down to –

```
OPENW #0
PRINT "Hello World!"
END
```

A program to let you draw freehand on screen with the mouse while holding down the left mouse button is as simple as –

```
OPENW #0
REPEAT
```



Fred Fish has assembled and distributed, world wide, over 250 disks full of all sorts of useful and novelty bits and pieces for the Amiga. Contents of the Fish disks, as they are known, include images, programming languages, sound samples, virus detection and destruction utilities, font sets, games, animation demos, and just about every type of tune-up or adjustment tool you could possibly imagine.

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These images of Marilyn Monroe are just one of the many Amiga IFF images that can be found on Fish Disk 72.

```
    WHILE MOUSEK=1
      PLOT MOUSEX,MOUSEY
    WEND
  UNTIL MOUSEK=2
  END
```

All things considered, you could say I am impressed with GFA-Basic. The interpreter is incredibly fast, the language is rich and friendly, the editor is very good, and what more could you want from a Basic interpreter? GFA-Basic comes with a run-time interpreter module that can freely distribute with your programs. The run-time module is reasonably small at about 80 kilobytes. Like most of the best recent Amiga software, GFA-Basic originates in Germany, to be precise it's GFA Systemtechnik. I really don't think I'll be going back to AmigaBasic now!

The third language is Amiga Logo (rrp $120). Years ago I heard about a language which had been developed for kids, as their first computer programming language. The language had a component called Turtle Graphics. Well, here it is on the Amiga.

Amiga Logo is a full implementation, and extension, of the Logo language which has been cleverly crafted to take advantage of Amiga's environment. This version of Logo has remained faithful to the vocabulary and commands found in the large number of Logo textbooks available all over the place. The environment is interactive, meaning that commands can be entered and the results observed immediately. There is also an emphasis on the development of modules or procedures, sets of commands which can be named and called up as required. This is an excellent language for kids to start with, encouraging as it does the structured approach used by programming professionals.

Stunning images can be created with a few short commands, and the immediacy of the process encourages you to experiment and learn while having fun. I seriously believe that a five year-old can learn Logo, and I'm going to put my theory to the test with my young nephew. I'll keep you posted on his progress. At the other end of the age band, adults can make valuable use of Logo as a first language. Programming concepts which are so easily learned using Logo, are directly applicable to any of the major programming languages in use today.

Amiga Logo is attractively presented in a hard library box which contains the disk and an attractively ring-bound manual. The manual is divided into Tutorial and Reference sections, and accompanied by a quick-reference card for Logo commands and primitives.

Regular readers should hang onto their hats at this point. The Amiga Logo software and manual were developed by Carl Sassenrath, and published by Commodore. Now for the curly one. This is a great manual! It's easy to read, shows heaps of screen images and examples, and is well indexed and cross-referenced. What has happened Commodore? Is this a sign of things to come? Are future machine manuals also going to take this form? I get the impression that Commodore are going to release Amiga Logo at a very good price – all part of Commodore's better late than never attack on the education market. I wish them all the luck in the world. This is the sort of product the Amiga needed two years ago. Amiga Logo is the sort of package that *every* Amiga owner should have in the collection. Top stuff!

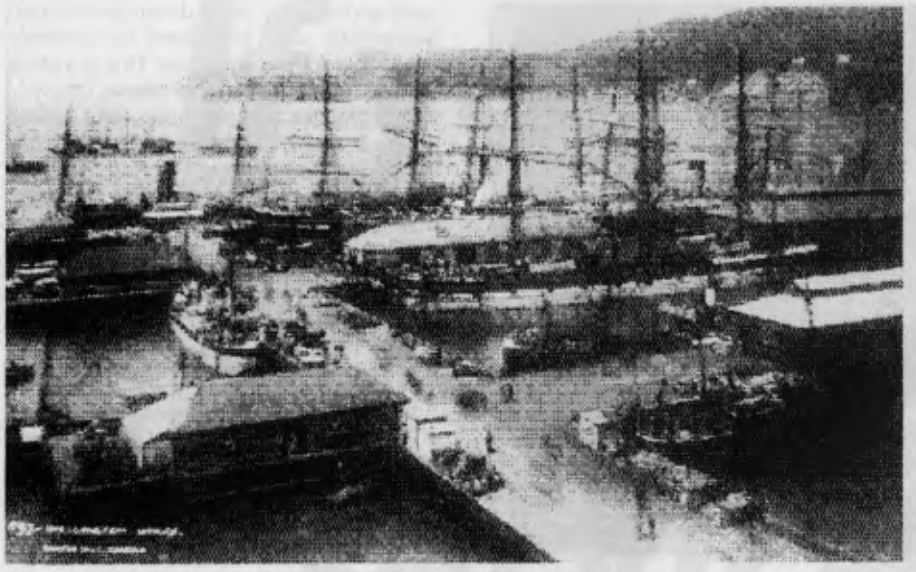
A tool kit of Amiga help

WHEN YOU BUY a computer, like the Commodore Amiga, you are in a very similar situation to the owner of a new car. If you already know how to drive, even if you learned on a different make of car, you will probably be able to drive the new one adequately. Practice, and a read of the owners' manual, will make you proficient. If you don't know how to drive, owning a new car will not, of itself, teach you. Reading the owners' manual will probably be of little use too. What you will need is driving lessons. For most people making their first purchase of a computer, lessons are equally important if you are to become a successful user.

There is another similarity between computers and cars. When you buy a new car you will usually find, if you search diligently enough, a little vinyl pouch containing a couple of items laughingly referred to as a tool kit. Anyone who has ever been caught with a flat tyre or a broken fan belt on a wet night will know the very limited usefulness of the standard tool kit.

A computer is surprisingly similar. With your Amiga, you receive a Workbench disk containing a drawer labeled Utilities, and another labeled System. Within these drawers are the standard tools for your Amiga. These tools will permit you to copy disks, enable or disable Fast memory, reconfigure your keyboard, and perform several other tasks.

The very limited nature of these tools will become obvious the first time you 'break down on a rainy night'. The Diskcopy tool, for example, will only copy validated AmigaDos format disks. It won't copy a disk which has invalid sector structures, as many games disks have.



This image of Wellington Harbour is just one of the many on Disk 72 of the Fred Fish collection of Public Domain – the images range from good to great.

Similarly, the standard Format or Initialise tool will not format a disk which has any hard errors on it. The fact that a disk has a tiny speck of magnetic coating missing from one sector will make it useless to standard formatting tools. There are perfectly good and valid reasons why the standard tools are as they are, and I have no argument with them. It is important though for Amiga users to realise that the standard tools are not the end of the story.

Fish disks

WAY BACK IN the early days of AmigaDos, around 1985, a gentleman in the United States took it upon himself to act as a collection point and clearing house for Amiga public domain and shareware. The man's name is Fred Fish (I kid you not!) and he is still doing it.

To date Fish has assembled and distributed, world wide, over 250 disks full of all sorts of useful and novelty bits and pieces for the Amiga. Contents of the Fish disks, as they are known, include images, programming languages, sound samples, virus detection and destruction utilities, font sets, games, animation demos, and just about every type of tune-up or adjustment tool you could possibly imagine. Let me give you a few examples of the sort of things you can find on Fish disks.

On Fred Fish Disk 225 there is a package called MyMenu which allows you to add your own menus to the Workbench menu strip, to run commonly used commands. MyMenu will allow you to execute both CLI and Workbench programs, and is configured with a normal text file. It includes source code.

Fred Fish Disk 211 is Esperanto, a keymap modification to USA1 which, in conjunction with the supplied slate.font, will allow one to type in Esperanto and Welsh, in any program that will use keymaps and fonts. Glyn Gowing is the author of this package.

DiskSalv is Fred Fish Disk 212, and is a disk recovery program for all Amiga file system devices that use either the Amiga Standard File System or the Amiga Fast File System. DiskSalv creates a new file system structure on another device with as much data salvaged from the original device as possible. In other words, DiskSalv performs a similar function to the standard tool DiskDoctor, but does it faster, better and more effectively.

There are a multitude of valuable tools within the various public domain collections. There are also a number of commercial tools which are well worth lashing out a bit of the hard earned.

DiskMaster is a tool that enables you to move files from one device to another on your system, copy files, delete files, examine file contents, print text files, and all by simply pointing and clicking. Actually, that description doesn't do justice to DiskMaster. It's probably the single most useful utility program I have in my collection. Until you own a utility like DiskMaster, a routine task like rearranging your word processing document files from one disk onto another can become a major drama in several parts. With DiskMaster the job is done in seconds. At around $70 it's not even prohibitively expensive.

Another utility which I find essential for my continued mental health is Dos-2-Dos. This package enables me to format disks, in my standard Amiga drives, to MS-Dos 720K format, and to read and write files in MS-Dos format. This means that I can write my articles on either my Amiga or MS-Dos type computer, and switch back and forth between machines.

Given the predominance of MS-Dos computers in the business sector, and my preference for using Amiga whenever possible, it means I can combine business with pleasure. I've used Dos-2-Dos extensively for many months now and I would be totally lost without it. You can get this package for around $79 in Australia.

Other utility packages deserving special attention include BAD (a disk performance optimiser), Butcher (an image enhancement and modification tool), Grabbit (a screen image capture and printing utility), Quarterback (a hard disk back-up tool), Marauder and Raw Copy (tools enabling you to back-up most types of non-Dos or copy-protected disks).

The question you're probably asking now is 'How do I get to find out which are the more, and less, useful tools available?'. The answer lies in the range of Amiga magazines now available, and in Amiga user groups. Membership of a user group can open up a world of help and advice which can transform your computing. For users in isolated locations, it is still possible to subscribe to a user group and receive the periodic newsletters which most groups produce.

A series of Amiga specific books by Abacus covers just about every possible aspect of owning and using an Amiga. I've spent many happy hours browsing through the books in this series (there are 16 of them at last count) and I would enthusiastically recommend them to all Amiga owners.

Finally, the best way to get the most from your Amiga is experience. You can either gain it yourself, the slow way, or glean it from more experienced users, the smart way. A user group is, without doubt, the best way to pick up all the experience you need. □

TIM HARTNELL

Really basic

IN THE COLUMN this month, we'll be looking at a Basic program to dump out a PC file to the printer, some natty user-defined graphics for the CPC, and a 'frequency wave' creator for the CPC machines, which show the graphics potentials of those computers very well.

Firstly, we have a program to plot 'frequency waves' on your CPC computer. Once you have run it as listed, replace line 70 with the two variations. Then you can try playing around with the step size (line 60) and the number used in the Y assignment (line 70) to see what variations you can produce.

```
10 REM FREQUENCY WAVES CPC ONE
20 MODE 2
30 MOVE 0,0:DRAW 640,0
40 MOVE 0,=360:DRAW 0,360
50 MOVE 0,0
60 FOR CPC=0 TO 640 STEP 4
70 Y=100+28*TAN(CPC*PI/180)/EXP((CPC/3)*PI/180)
80 DRAW CPC,Y
90 NEXT

70 Y=200+40*EXP(CPC/7*PI/240)*SIN(CPC*PI/70)

70 Y=1+EXP(CPC/2*PI/150)+EXP(CPC/2*PI/150)
   *SIN(CPC*PI/55)
```

The Dos command RECOVER on the PC allows you to recover any files on a disk with a damaged directory, or any files containing damaged sectors. The command can be entered in two ways, either as: A>RECOVER A:, or as, A>RECOVER A:FILENAME.

When you trigger the RECOVER command, there will be much grinding from your disk drive as the work is done. Once the process has finishing, there'll be a message like: 6 file(s) recovered.

If you do a DIR at this point, you'll see the recovered files in this form:

```
FILE001 REC    5120  10-05-89   11.23a
FILE002 REC   17408  10-05-89   11.23a
FILE003 REC   18432  10-05-89   11.23a
FILE004 REC   16384  10-05-89   11.23a
FILE005 REC    1024  10-05-89   11.23a
FILE006 REC   35840  10-05-89   11.23a
```

When recovering a file, this command creates a new file with the same name which contains all the data from the original, except for that which was in the bad sectors. When you specify only a drive (as opposed to specifying a particular file), the command assumes that the directory itself has sustained some damage, and will act on all the files in the drive. Then, each and every file will be given a new name – as the sample DIR above suggests – which shows the order in which the files were recovered. You'll have to look at the restored files in order to determine what they are, and when you've done this, rename them back to their original names.

One message which Dos can give you when running RECOVER is: Warning – directory full.

You'll get this if you don't have enough space on your disk to hold more recovered files. If you get this message, simply copy the files which have already been recovered (those with the FILES001-.REC type names) onto another disk, wipe them from the first disk, and run the command again.

Hex Dump of Basic Program

IF YOU HAVE a printer, and are working with a standard Basic (not Basic2) on your PC, you can use the Hex Dump Program to print out a file in hex. Although the program needs a standard Basic to run, it will print out programs written in Basic2 or even a non-Basic file. Part of a printout, of the program dumping itself, is shown in Figure 1.

```
 0: 31302027 20486578 2044756D 70205072  *10 '  Hex Dump Pr*
10: 6F677261 6D0D0A32 30202720 596F7572  *ogram..20  ' Your*
20: 20416D73 74726164 0D0A3330 20272059  * Amstrad..30  ' Y*
30: 6F757220 436F6D70 75746572 0D0A3430  *our  Computer..40*
40: 20444546 494E5420 412D5A0D 0A353020  * DEFINT  A-Z..50 *
50: 434C5320 3A20434C 4F53450D 0A363020  *CLS :  CLOSE..60 *
60: 5052494E 54202248 65782046 696C6520  *PRINT "Hex File  *
70: 44697370 6C617920 50726F67 72616D22  *Display  Program"*

80: 0D0A3730 20494E50 55542022 456E7465  *..70  INPUT "Ente*
90: 72206669 6C65206E 616D653A 20222C20  *r file name: ",  *
A0: 46494C45 4E414D45 240D0A38 30204F50  *FILENAME$..80  OP*
```

Figure 1. Using the Hex Dump program in Listing 1 and a standard Basic, you can print out a file in hex. Although the program needs a standard Basic to run, it will print out programs written in Basic2 or even a non-Basic file.

Finally, as you know, you can assign your own graphics to character numbers on the CPC. Some DATA numbers are given below to re-define character 240. Simply change the 240 which follows the word SYMBOL to whatever number character you wish to change.

```
Space ship facing upwards -
SYMBOL 240,24,24,189,189,255,255,189,24

Flying Saucer -
SYMBOL 240,3,13,50,194,52,20,8,8

Waving Alien (alternate this with the following
character to create an animated alien) -
Frame One: SYMBOL 240,129,189.189.173,239,60,26,231
Frame Two: SYMBOL 240,231,165,189,181,52,255,129,231

Owl -
SYMBOL 240,255,153,231,231,231,126,42

Elephant -
SYMBOL 240,32,127,95,127,127,91,219,27

Frog -
SYMBOL 240,0,153,189,90,126,126,189,129
```

We'll be including 'Your Amstrad' in future issues of the magazine. I'd be interested in hearing from any companies making, or importing, software and/or hardware for any of the Amstrad computers. As well, I'd be more than happy to share any of your discoveries, hints, tips, comments and programs with other users, along with details of any Amstrad-specific user groups. A copy of my *Amstrad PC Users Companion* (disk and manual) will be given to anyone supplying PC hints which are used in this column. I have some CPC software to provide in return for CPC hints. Please write to 'Your Amstrad', Tim Hartnell, *Your Computer*, PO Box 227, Waterloo 2017 NSW. □

```
10 ' Hex Dump Program
20 ' Your Amstrad
30 ' Your Computer
40 DEFINT A-Z
50 CLS : CLOSE
60 PRINT "Hex File Display Program"
70 INPUT "Enter file name: ", FILENAME$
80 OPEN "R",#1,FILENAME$,128
90 FIELD #1,128 AS RECORD$
100 PRINT "Dumping "+FILENAME$+" . . ."
110 OPEN "lpt1:" FOR OUTPUT AS #2
120 PRINT #2, "Dumping "+FILENAME$+" . . ."
130 PRINT #2,""
140 OFFSET = 0
150 RECORDOUT$ = ""
160 RECORDOUT1$ = ""
170 '
180   GET #1
190   PRINT #2, ""
200   IF EOF(1) THEN 350
210   FOR I=1 TO LEN(RECORD$)
220     CHAR = ASC(MID$(RECORD$,I,1))
230     CHAR$ = HEX$(CHAR)
240     IF LEN(CHAR$)=1 THEN CHAR$="0"+CHAR$
250     RECORDOUT$=RECORDOUT$+CHAR$
260     CHARPRT$ = "."
270     IF CHAR ( 32 THEN 300
280     IF CHAR )= 127 THEN 300
290     CHARPRT$ = CHR$(CHAR)
300     RECORDOUT1$ = RECORDOUT1$ + CHARPRT$
310     IF LEN(RECORDOUT$) )= 32 THEN GOSUB 400
320   NEXT I
330   GOTO 180
340 '
350 GOSUB 400
360 CLOSE
370 PRINT "File Display Program Ended"
380 STOP
390 '
400 RECLEN = LEN(RECORDOUT$)
410 IF RECLEN = 0 THEN 540
420 OFFSET$="    "+HEX$(OFFSET)
430 OFFSET$=MID$(OFFSET$,LEN(OFFSET$)-4,5)
440 PRINT #2,OFFSET$+":  ";
450 J=1
460   IF RECLEN-J ( 8 THEN 500
470   PRINT #2,MID$(RECORDOUT$,J,8)+" ";
480   J = J + 8
490   GOTO 460
500 PRINT #2,MID$(RECORDOUT$,J) + " *" + RECORDOUT1$ + "*"
510 OFFSET = OFFSET + RECLEN/2
520 RECORDOUT$ = ""
530 RECORDOUT1$ = ""
540 RETURN
550 '
560 END
```

```
10 REM FREQUENCY WAVES CPC ONE
20 MODE 2
30 MOVE 0,0:DRAW 640,0
40 MOVE 0,=360:DRAW 0,360
50 MOVE 0,0
60 FOR CPC=0 TO 640 STEP 4
70 Y=100+28*TAN(CPC*PI/180)/EXP((CPC/3)*PI/180)
80 DRAW CPC,Y
90 NEXT
```

Listing 1. *The Hex Dump program which works with a standard Basic (not Basic2) running on a PC.*

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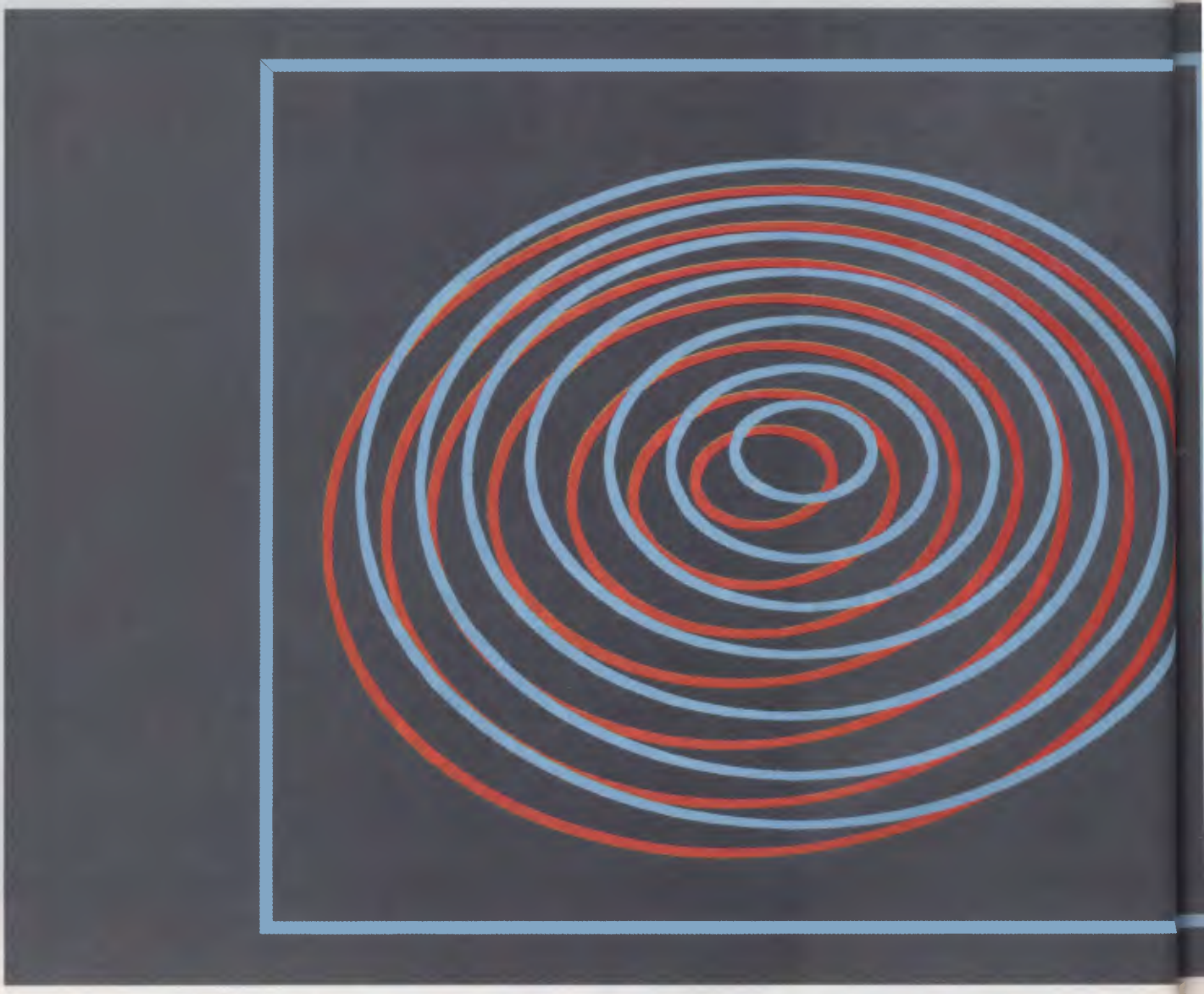


PRODUCING TRUE 3-D GRAPHICS

THREE-DIMENSIONAL graphics, as applied to computers, have been the subject of much development recently. 3-D modelling is big in CAD work; you can make the thing you're designing *look* like it's a solid object, with texture and depth. The same general idea is taken further on our TV screens every night: a computer generated station ID that makes the logo look like it was cast of solid silver.

These graphics are most impressive, but they're really an illusion. It could be argued that even the very best computer-drawn images might look solid, but they don't contain any depth information at all – only an *illusion* of depth. In this article we will look at ways to produce simple graphic images that contain proper computer-generated *depth* information, as well as width and height.

As with many of the things I do, what will be presented here will be pretty useless on its own account – just some pretty

Real 3-D on your PC? It's easy the way Tom Moffat describes . . .

circles to look at. But the images are the simplest way of demonstrating experiments to generate true 3-D images on a flat computer screen. You will be able to see rings buried deep inside the picture tube, or programmed the other way around, they can jump right out of the screen.

The idea of this simple project, then, is to get the ball rolling, to get you to take this somewhat primitive experiment and turn it into something really smashing. The potential is certainly there. But before launching into the technicalities, it might be interesting to look at some history.

3-D novelties

'PROPER' 3-D PICTURES, as compared to pictures with just an illusion of depth, require the use of two eyes to add the third dimension. Such pictures are generally referred to as 'stereo' images. Stereo pictures are usually made with two cameras viewing the same scene, separated by approximately the distance between a pair of human eyes. The two cameras are focused simultaneously, and they share a common shutter release button.

Stereo photography first became popular around the turn of the century, and every well-to-do parlour had a gadget called a stereopticon. This was a simple frame into which you could fit a *stereo pair* of snapshots. The frame could slide up and down along a wooden track. At the other end of the track was a pair of lenses you could look through like a pair of binoculars. Each lens, one for each eye, looked upon one of the two pictures in the frame. You slid the frame closer or further from the lenses to get focus.

I remember as a kid, my grandmother had a stereopticon and a good collection of stereo photos. You could see a pretty lady wearing a bonnet, standing in front of a horseless carriage, with a big mountain range in the background. And it was so real you could just about reach out and touch them.

The same principle was popular right up through the 1950s, only the pictures became 35mm colour slides, taken with a special double camera. There was a special viewer, again with two eyepieces, and looking through one was a mind-shattering experience. Especially when the subject was something like a view over the rim of the Grand Canyon. Magic!

Also from the '50s, the 3-D movies. Anyone remember them? I do, like the time as a young child when my uncle took me to see one. There was an earthquake and a landslide, and all these rocks came rolling out of the screen and right into the audience . . . I hit the deck!

There was one big disadvantage with 3-D cinema. To get a separate image for each eye, you had to wear a special pair of glasses. There were two systems in use. One projected the two images onto the screen with two different polarisations, one vertical and one horizontal. The glasses were also polarised with one vertical and one horizontal lens, so the correct image could only make it through the lens with the correct polarisation. This produced top quality stereo images with the full colour intact.

A somewhat rougher system projected the two stereo images through two coloured filters, one red and one blue. The glasses you wore also had one red and one blue filter, so the two images were sorted out on the basis of colour. The trouble was, any legitimate colour information was also filtered out, so only black-and-white pictures were possible.

Last year, some experimentally-minded producers at the ABC decided to have a go

3-D Cones uses the red-blue method to generate the stereo image – many of these were sent out by the ABC for the Blah Blah Blah experiment and thousands of pairs were also handed out at Expo. If all else fails, you can always make some out of bits of red and blue cellophane. When used, make sure the red filter is over your left eye.

Figure 1. Put your 3-D glasses on, look at the printout and see the cone receding back into the page. Let your eyes relax, and don't hold the magazine too close. Once you've got that conquered, hold the magazine upside-down and try it again. What happens this time?

at transmitting 3-D television, using the red-and-blue stereo imaging technique. The subject was a program called Blah Blah Blah and for several weeks prior to the experiment, the ABC advertised a supply of the glasses, free to anyone who would write in. I don't think many people thought this was possible; even my own wife got a real laugh out of watching me waste a 39 cent stamp on a 'hoax'. That is, until the glasses arrived, and Blah Blah Blah went to air.

It stopped her in her tracks, it did! Luckily we taped the program, and the whole family spent hours re-playing the 3-D parts of it over and over. The vision quality wasn't very good, I think the ABC might have just used red and blue theatrical lighting gels to split the images instead of proper optical filters. But sure enough, it was 3-D television, right there on the little screen. No earthquakes or landslides, but this time one of those cannons that fires tennis balls, trying to shoot them through the screen and all over our lounge room. As well as tennis balls, the ABC experiment would have flooded Australia with thousands of pairs of those red-and-blue 3-D glasses, which (until now) have had no further use.

3-D on the IBM-PC

THE PROGRAM IN Listing 1 uses the automatic shape drawing routines in GW-Basic to produce a series of concentric circles forming a cone. In the version of the program as shown, the viewer looks into the wide end of the cone and sees it receding away into the distance. The narrow end of the cone appears to be somewhere deep inside the picture tube.

The program uses the red-blue method to generate the stereo image, and you will need a pair of red-blue glasses to view it. As mentioned, many of these were sent out by the ABC for the Blah Blah Blah experiment. Thousands of pairs of 3-D glasses were also handed out at one of the pavilions at Expo. And if all else fails, you can always make some out of bits of red and blue cellophane. The photograph should show what's required. Make sure the red filter is over your left eye.

Let's see how the program in Listing 1 works: Lines 20, 30, and 40 set everything up, selecting the graphics mode, the background, the image colours, and clearing the screen. Line 50 draws a white box around the cone. Since the box is white it contains no depth information, so it serves as a frame of reference to show where the surface of the monitor screen is. 3-D images will then be in front of or behind this box.

It was science fiction then, but that technique actually exists now, although it's still experimental.

Lines 70 through 110 draw the part of the stereo image intended for the left eye: a series of seven concentric circles in red. We begin with variable D set to 158, so the centre of the biggest red circle is at co-ordinates 158,100. The radius of the largest circle is 1, or 48 units and '2' sets its colour to red.

In Line 80, 6 is subtracted from the radius to make the next circle smaller. *But* (here's where the 3-D part comes in) the next circle is also moved one unit to the left by subtracting 1 from D at line 100. So, each of the red circles is 6 units smaller than the previous circle, *and* stepped one unit to the left. Since the circles contain depth information they are not 'concentric' at all, because their centres keep moving outwards!

The blue circles, the part of the image for the right eye, are now drawn beginning at Line 130. The largest circle is centred at 162,100 and each further circle imparts depth information by stepping one more notch to the right. As before each new circle also becomes 6 units smaller.

There appears to be a discrepancy between what appears in my Basic manual and what actually happens in GW-Basic. Officially, colour 1 is supposed to be green, but it's blue on my computer. Likewise colour 3 is supposed to be brown, but I get white. This is fine as far as I am concerned, because blue and white are the colours we want. But why is the book different?

Note that the largest circles are displaced by four units at the start of the program. This makes the first circle appear to

```
10 REM 3-D CONE
20 SCREEN 1: REM Medium resolution
   graphics, 320x200
30 COLOR 0,0: REM Black background,
   palette 0
40 CLS: REM Clear the screen
50 LINE (90,40)-(230,160),3,B: REM Draw
   the box
60 REM Draw the red concentric circles
70 D=158
80 FOR I=48 TO 12 STEP -6
90 CIRCLE (D,100),I,2
100 D=D-1
110 NEXT I
120 REM Draw the green concentric
    circles
130 D=162
140 FOR I=48 TO 12 STEP -6
150 CIRCLE (D,100),I,1
160 D=D+1
170 NEXT I
180 END
```

***Listing 1.** This Red/Blue version of 3-D cone uses the automatic shape drawing routines in GW-Basic to produce a series of concentric circles forming a cone – the viewer looks into the wide end of the cone and sees it receding away into the distance while the narrow end of the cone appears to be somewhere deep inside the picture tube.*

be well back inside the monitor screen, and the others go back further still. So, the further apart they are, the deeper the circles will appear. There is a limit to this, of course, and if you spread them too far the 3-D effect will disappear. This problem occurred a few times during the Blah Blah Blah telecast. I suspect it might have been caused by the red and blue camera lenses being further apart than normal human eyes. That's only a guess, though.

You will find it interesting to play around with the 3-D Cone program yourself. For instance at Lines 100 and 160, you can try different numbers to be added to or subtracted from D. This will vary the amount of depth in the image. If you step one or the other centres but not both, you'll get a good 3-D image, even though the picture is no longer symmetrical. Another idea is to swap the red and blue colours. This should make the cone poke out of the screen at you, instead of receding away. I find the receding effect is much easier to see for some reason.

Free-viewing

WHAT HAPPENS IF you don't have a colour monitor? Well, all is not lost. Going back to the old-time stereopticon pictures, they were in black and white, but they were still proper stereo images. Remember that they were two completely separate pictures, laid side by side instead of superimposed on one another. The stereopticon used a pair of lenses to make sure the right eye saw only the right picture, and the left eye only the left picture.

However, with a bit of practice and concentration, it is quite possible to view stereopticon pictures without using any instrument at all. You just learn to stare with your eyes *not converging, so that the left eye stares at the left picture and the right eye stares at the right. It isn't easy, but it can be done. The technique is called 'free-viewing'.*

The trick is to stare off into the distance so both your eyes are aimed parallel with each other. Then you slowly raise a stereo pair into your line of vision. You must then try to focus on the nearby pair of pictures, without letting both of your eyes fall upon one picture or the other. I know this sounds hard, and it is, but you'll soon get the hang of it.

Magazines like Scientific American have occasionally published articles on 3-D imaging, with some nice stereo-pair illustrations to look at by free-viewing. Even the Sydney Stereo Camera Club's newsletter publishes stereo pairs for free-viewing practice.

Listing 2 is our familiar 3-D cone program, re-written for free-viewing. You can either use a monochrome monitor, or print the image out on paper. The image will look like the front surface of a female robot, but you can 'stare' it into a pretty impressive receding cone.

```
10 REM FREEVIEW A 3-D CONE
20 SCREEN 1: REM Medium resolution
   graphics, 320x200
30 COLOR 0,0
40 CLS
50 LINE (20,40)-(160,160),3,B: REM Draw
   left box
60 LINE (160,40)-(300,160),3,B: REM Draw
   right box
70 REM Draw circles on left side
80 D=88
90 FOR I=48 TO 12 STEP -6
100 CIRCLE (D,100),I,3
110 D=D-1
120 NEXT I
130 REM Draw circles on right side
140 D=232
150 FOR I=48 TO 12 STEP -6
160 CIRCLE (D,100),I,3
170 D=D+1
180 NEXT I
190 END
```

Listing 2. The 3-D Cone program, re-written for free-viewing – either a monochrome monitor or printed image can be used for viewing.

Here, all the drawing is done in white (or amber or green, depending on your monitor). We've pushed the cones apart so that each one is in its own frame, and the frames touch. You can attempt to form the 3-D image by free-viewing the cones straight off the monitor. When this is starting to work you will see the two frames with their cones move apart, and a third frame will form between them.

I've practiced free-viewing a fair bit while preparing this article, and I can now bring up the free-view 3-D cone image to full quality in just a couple of seconds. You will be able to, too.

What's it good for?

REMEMBER THAT THESE two little programs are only a simple demonstration of what can be done with true 3-D. I suppose the next step would be to animate the display. You could perhaps draw the small circles first, erase them, enlarge them, move their centres inwards, and draw them again. This should produce the effect of moving down the cone toward infinity. Since Basic is pretty slow, you'd need to do this in something like C or assembler. What a program that would be! You could really impress yourself by sitting there staring down the moving cone and making Dr. Who noises.

No, forget that idea. What we really need is for some clever programmer to build on the red-blue 3-D imaging technique and produce an arcade game. There used to be a Microbee game called Star Striker or something like that, where you flew a Star Wars spaceship off toward infinity. The program produced a pretty reasonable 3-D effect by using converging lines to suggest depth. Imagine the same thing with true 3-D. The enemy ships could jump out of the screen and hit you right between the eyes if you didn't get them first.

The red-blue system might not be with us much longer. Remember, in Star Wars, the effect in which the girl appeared in miniature 3-D, projected into thin air by a laser? It was science fiction then, but that technique actually exists now, although it's still experimental.

And then there are the 3-D covers produced by *National Geographic* magazine. One memorable cover was an image of the world as a transparent globe. Since it's an American magazine, the North American continent was most prominent, so Australia was around behind. Since the globe was transparent you could see Australia, but poor little Tasmania was obscured by a land mass, left off the map yet again! However, this time you could see Tasmania by moving your point of view and looking around *behind* the offending continent. Now that is true 3-D!

The *National Geographic* covers were solid holograms, somehow carrying true stereo information without the need for glasses to view them. The solid holograms are moderately cheap to reproduce in quantity, so we should be seeing more and more of them.

So what about 3-D computer graphics, once lasers and holograms become more economic? I suppose you can throw away your red-blue glasses, and the CRT monitor as we know it will probably be headed for the rubbish tip too, to be replaced by some gadget that projects a solid image into the space on top of your desk. Will that then be the ultimate? Probably not! □

STEWART FIST

Mud on Adobe's walls

GUY KAWASAKI, the head honcho at Acius (4th Dimension), once defined PostScript as 'the technical term for a lucrative royalty stream from Apple to Adobe.' I don't think anyone in the know at Apple would argue with him on this one – until a couple of months ago, anyway.

Adobe and Apple have now parted company. Apple sold their Adobe shares and established a *de facto* relationship with Microsoft, leaving Adobe and the infant PostScript to fend for themselves. Apple says they were just too extravagant to maintain.

You couldn't call this parting of the ways anything other than an acrimonious divorce. Apple and Adobe have been in bed together ever since desktop publishing was conceived – and PostScript, of course, was one of the little wiggly things that made it possible (I don't think I'll carry this metaphor further). Let's say that PostScript was essential to Apple's success in developing desktop publishing, and desktop publishing was vitally important in making the company (and the Mac) what it is today.

Apple's LaserWriter, which was created in 1985, was one of the first PostScript laser printers and it was quite revolutionary. Before that time we'd never heard of page-description languages, or of the page-imaging models that lie at their heart. Everything on the Mac was bit-mapped, and bit-mapping screens of text were revolutionary enough in those days, anyway.

Until the Mac came along, we didn't have a computer that was totally graphically-oriented. Characters on the screen had been generated by ROM chips (as they still are in many IBM and Apple II machines today). The word 'font' was new: if you wanted to change fonts in the old days, you went out and bought a new ROM chip. And even then, what you saw on the screen bore absolutely no relationship with the style of characters printed by the printer. The printer was just told to print an 'a', and it printed whatever 'a' happened to have in its ROMs or on its daisy-wheel.

QuickDraw was one giant leap for computer-kind – the first step into a new universe outside the old character-type computers. And PostScript, when it finally arrived, was something else again.

A page at a time

JOHN WARNOCK, WHO owns and runs Adobe, developed the PostScript idea. Basically, it was to get away from the old technique of sending information to the printer one line at a time. Warnock's idea was to assemble the whole page in the computer and send it to the printer as a complete set of instructions which incorporated both text and images. He could only do this with printers that were intelligent enough to interpret the page description, and had the memory to store it.

You couldn't call this parting of the ways anything other than an acrimonious divorce.

Remember, it takes about one megabyte of RAM to hold the pixel information for one black and white A4 page, if you are treating the information in dot-by-dot, bit-mapped form. Then, if you want to scale up or scale down any image stored this way, you've got problems. If you just double all the dimensions, that's not too bad. The computer can then generate 4 dots (2 wide by 2 high) for each previous pixel, so you get four times the image area but no actual increase in image resolution.

Anything less than the twice-dimension means that the computer has to calculate intermediate stages if it is to avoid the dreaded 'jaggies'. If you attempt to reduce the size of the image, the problem gets much worse because you are then dealing with the need for fractions of pixels (which aren't possible) and you have fewer pixels to allow averaging.

Warnock's idea was to store the information in the printer as a series of mathematical commands. He first developed the idea in a product called Jam at Xerox' PARC establishment, where most of the early ideas for the Mac seem to have been worked out. Xerox must hold the dubious management record for the number of world-beating technologies they allowed to slip through their fingers. They should establish a PARC award for 'lost opportunities', just as a reminder.

In concept Warnock's idea was simple, but difficult in conception. Instead of a horizontal black line being represented in the printer memory as, say, a series of 100 memory locations, each with the bit set to 1, he would send a command to the printer which effectively said, 'starting at co-ordinates x,y, draw a line to co-ordinates u,v'. In videotex terminology, this technique is known as alpha-geometric – as distinct from alpha-mosaic.

You can take this geometric approach using all sorts of mathematical 'primitive' equations which gives you squares, circles, arcs, and so on, and these can be used to draw a full screen of any degree of complexity. It sounds as if it is a ludicrous way to draw each individual character on the screen, but it isn't. You simply hold the description of each letter (of each font) once, and reproduce it at any location, and in any size or style (bold, italics, outline) necessary.

Once you are holding images of the page-elements in this form, you can scale them up or down to any degree, and in any incremental steps. PostScript will then calculate the best possible image to send to the printer for the size and style you want. If it is a 72 dpi ImageWriter, it will create the best possible 72 dpi compromise, and if it is sending the image to a 300 dpi LaserWriter, it will do the best possible job here; and if the peripheral is a 2540 dpi Linotronic 300 photo-typesetter, it will scale-up the image (in pixel terms) to produce graphic quality equal to anything you are ever likely to see.

Note that the printer itself must interpret these commands and produce a totally bit-mapped image internally before it can begin to print. A laser printer can't print half a page now, and then do the other half later – it needs to construct the

whole page, and then transfer that image to the printing drum in one steady flow. This is why you need to have at least 2 Megabytes of RAM space, a microprocessor, ROMs with the PostScript interpreter, font outlines, and mathematical formulas (collectively called the controller) in your printer to handle PostScript.

Advantage

ONE MAJOR ADVANTAGE of PostScript is that it is device-independent. So, although Apple took it to their collective bosom and promoted it madly as an Apple breakthrough, it soon became established as the PDL for any software and output device seriously involved in the desktop publishing business – MS-Dos and IBM included.

The fact that only one font definition was needed to create any size or style of type is another major plus. With bit-mapped fonts, you've got to have one for every size you intend to use, or you'll suffer the effect of the dreaded 'jaggies'. PostScript font definitions only supply the outline of the character, which is why these are also called 'outline' fonts (naturally), but once the outline is drawn, the cavity is filled automatically.

Adobe also has a technique called grid-fitting, and it appears to be part of the reason why PDL clone makers haven't been able to match PostScript's quality. Grid-fitting adjusts the outline when the pixel 'grain' begins to dominate with small-size characters, and so on. It makes these images sharper and cleaner. Adobe play this grid-fitting game very close to their chest because they believe the secrets of the process are the key to their survival. So you can bet your life that Apple and Microsoft have been reverse engineering these techniques like mad over the past few years.

PostScript systems contain encryption rules (called 'hints') that specify how this grid-fitting is to be performed. These same rules are applied across the total range of Adobe fonts, and this is only possible if Adobe strictly controls the design of the type styles. For instance, each font in their series must have the vertical stems of all letters the same width – you can't design a PostScript font that has the stem of a 'b' thicker than the stem of an 'l' in the same font. This is a major limitation, and while it exists there will always be some type styles which aren't possible, or which don't look quite right. Another complaint following the same line, is that these rules ensure that Adobe's fonts all tend to look bland, and pretty much the same.

However, despite these limitations, and with the slight exception of Hewlett-

Packard's page description language, PostScript is the only game in town – and certainly, until now, the 'unassailable' standard for laser printers in desktop publishing.

Developers have been trying to clone PostScript now for quite a few years and it has turned out to be very difficult to do without infringing Adobe's copyright. When you think about it, that is almost to be expected. At base-level, Adobe must be using straightforward mathematical expressions (which *can't* be copyright protected), but it must also have applied these in their own unique way (which *can* be copyright protected). It is this second factor that constitutes the 'language', and that's what everyone is trying to copy.

Xerox must hold the dubious management record for the number of world-beating technologies they allowed to slip through their fingers.

Bugs

POSTSCRIPT ALSO has some bugs which are widely documented, and have been tolerated and 'patched'. Rather than being corrected at the source, these bugs have progressively been worked around by page-layout programs over the years – the layout software doctors up the PostScript description before it is transmitted to the printer. As a consequence, any clone has to mimic the bugs, if it is going to act the same. You can now see how Apple and the other users of PostScript have been digging themselves a bigger and deeper hole.

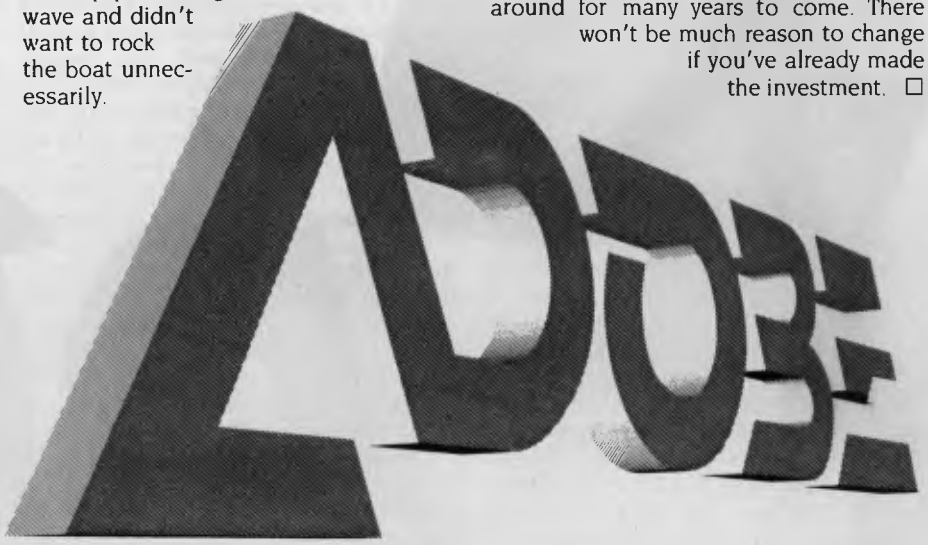
Adobe claims to only charge $200 for a license to use PostScript on every laser printer sold, but no one really believes them. The actual figures are subject to non-disclosure contracts, and Adobe admit that there is a fat up-front fee also, but no one is saying how much. There is also an annual license on top of the per-machine royalty.

There's obviously a very substantial mark-up somewhere along the line between the printer manufacturers and the suckers who buy. PostScript equipped printers often cost $3000 more than an almost identical non-PostScript printer, and there's not $3000 worth of electronics involved in the controller – so someone is taking a hefty slice of the cake. Judging by the fact that every company using PostScript goes out for Adobe and Warnock on every possible occasion, you can take a pretty good guess who's taking the slice.

The problem, as Apple and the rest of the hardware industry see it, is that they have managed to get themselves locked into a monopoly supplier, and this is simply bad business practice. (The complaint, coming from a company like Apple, is also hypocritical, but let's not talk about it.) Warnock has a reputation for throwing his weight around, and being difficult to deal with – which is probably just another way of saying that he is a tough negotiator, and he squeezes blood out of stones as a leisure activity.

Apple, and the other computer makers, are now also facing the need to standardise their screen-description language to the same basic standard as their preferred page-description language. The core for both must obviously become a central part of the operating system – this is the only way that we'll ever get true WYSIWYG. If they were to take up Warnock's Display PostScript (as Jobs has done with the Next machine) as the way to drive the screen, and dumping QuickDraw in the process, then they'd be even more locked into Adobe's monopoly.

You can see now why Apple has had to make the break now. My guess is that they wish they had the courage to do it earlier, but I guess they were riding high on the desktop publishing wave and didn't want to rock the boat unnecessarily.



However, a cross-license agreement with Microsoft was too good an opportunity to miss, because between them they could tie up 80 per cent of the known desktop publishing world.

IBM and Apple

MICROSOFT HAS been working for a long time on an alternative printer driver using source code acquired from Bauer, and Apple had found a way to add Royal outline fonts to their QuickDraw. Since these two have decided to cooperate in developing an open standard with common screen and printer techniques, this can only produce common page-layout standards between the Mac and the OS/2 Presentation Manager. In the future, you should be able to pass fully formatted documents between the IBM and the Apple systems.

Apple's font manager will be an integral part of the operating system, which means that all QuickDraw applications and printers can use the new outline fonts without modification. The new System 7.0 promises to have on-screen scaling of these new outline fonts. Adobe are fighting back with Adobe Type Manager which will do much the same thing, so for a while, two standards will co-exist. Apple say that they will be able to provide many of the advantages of PostScript without users needing to buy a costly printer controller – which should be a boon to new laser printer purchasers.

Don't panic if you've already made a substantial PostScript investment because Apple don't intend to abandon Mac users who persist with the Adobe standards. PostScript in entrenched as the high resolution printing standard, and it will be around for many years to come. There won't be much reason to change if you've already made the investment. □

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JOHN BAILEY

Another CAD

MY NEW YEAR'S Resolution – try not to believe all I see and read. In November I joined the committee of a Land Conservation District on a trip to Esperance, WA, about 500km east of here. Amongst the sights was a run-down on Western Australia. Landman package used to plan the farm strategy for Gary and Jan English who won this year's *Elder's Weekly* award for conservation farming. So what? I studied the data, quizzed the WA Agriculture Department, and wrote an article (August issue) about farm planning in which I said that Landman was a working system and the database was growing. If that is so, then they have left Esperance out. I was all set to get the man to show me bits of other shires via the wonders of modern technology, and lo' there was nothing coming out of the back of the computer but a dongle. (For $3000 a copy you'd think Intergraph might attract a more superior type of client that could be trusted not to pirate their software.)

Looking back on my contributions to *YC* over the past year, I think most things have been as accurate as one might expect. Some people have telephoned to inquire about various items mentioned which shows that some articles have been read. I seem to have been keen on drawing and design packages although the management of money has also interested me, but I am a little piqued that no-one in the city took any notice of my article about how to deliver parcels to the country, and my recent experience with Softcover Software illustrates this.

I responded to an advertisement for a 3-D CAD package that said 'Can CAD cost $249?' The rest of the page gave a resume of the program and comments from favorable reviews in several magazines. The clincher was the sentence, 'Try TurboCAD for yourself ...obligation free for 14 days.' I have never before ordered, or accepted, a test of any product on this basis, but I needed a good 3-D CAD package. In a break with tradition, I gave it a try and wrote to Softcover Software because I didn't want to excise the order form from the journal in which it appeared (the other side had important information on it).

In my letter I explained that Australia Post delivered to my door whereas no other courier did, and I would really like the software sent via Australia Post. I also asked them not to send it if the 14 Day business would be jeopardized because it might take the package too long to get here.

My first mistake was to provide payment details. Had I written with an inquiry but no cheque or credit card number then perhaps dialogue may have commenced regarding my specific delivery instructions. A friend has pointed out to me that we only read as much as we expect to see, so that when my letter was processed, the only details noted were those relating to payment.

Getting the run around

WHATEVER THE reason, I heard nothing from anyone until I noticed that money was deducted from my credit card account. This information led me to believe that the article may have been consigned, so I let 'my fingers do the walking' and phoned Softcover Software. 'Indeed the stuff was sent, we are not sure of the name of the courier, but we shall return your call.' I am out a lot and can easily miss calls, so when nothing was heard I rang, 'Yes, your parcel is in Western Australia, we are told that the courier was holding the parcel for you. No, we still don't know which courier.' I asked if the courier knew how to contact me but 'it isn't normal practice to write the recipient's phone number on parcels because the street and number is sufficient.' Eventually, I drove the 110km to town and back to get the thing, and then I installed it. Now I'm going to un-install it and send it back. There is nothing wrong with it at all, but I need either a Hercules card or an EGA card to run the 3-D side of it and I don't have the shekels to buy the new screen and card. TurboCAD is a comprehensive software suite, and is well packaged and presented, the manual is as good as any other, the price is very good, and the software appears to be able to handle everything that I would like to achieve. The command set for TurboCAD is not as easy to learn as some other CAD sets, but the range of commands is great, and this diversity of commands makes it difficult to have simple alliterative commands. I am impressed by the speed with which the screen may be refreshed after deleting or changing. This is because most of the 2-D work is done in RAM, and a screen refresh does not involve heavy recalculation. Many other CAD packages seem to have to re-work the whole drawing to refresh the screen, and thus take considerably longer.

Looking back on my contributions to YC over the past year, I think most things have been as accurate as one might expect.

I am not impressed with the manner in which TurboCAD prints a design. There are good reasons for using the method, but the results that I got were not of a very high standard and a design is useless if the hard copy doesn't come up well. The method used consists of writing the drawing to a PRN file which can then be output to a device (LPT1) by the Dos Print command.

I am resolved to be patient and wait for a credit to appear on my bank statement, but it would appear that debits are faster than credits. Sometime this year, I'll have an expert system for us to look at (first I must learn to use it) and Melden Laboratories are offering flock testing services, providing the data on floppy disk in a form accessible to common spreadsheets. I would also like to bring forward some of the software available that might be of help in educating isolated children. There are some good packages available for IBM clones, at a reasonable cost, that could be used by the many correspondence teachers in the bush.

Good luck to all of you this year. □

RITA PLUKSS

Computer music

MUSIC HAS BEEN said to be food for the gods, and for us mere mortals a welcome respite for the soul. Rhythmical sounds have always played a part in our lives, sometimes for the better, other times it can take us to screaming point. If your kids are into heavy metal or the like, you may know what I mean. But there is no denying that music, whether it be of classical, modern or primitive beats, always has some type of effect on us.

Computers and music make a good pair. The inclusion of MIDI IN and MIDI OUT ports in the Atari ST design was not an accidental one to fill a gap on the left hand side of the ST (next to the cartridge port). It was meant to fill a hole in the computer market – the use of computers for musical applications. And from all accounts the Atari ST has done this well, being used by a number of well known musical professionals for a variety of purposes.

In the modern music arena names such as Tangerine Dreams, Fleetwood Mac, Ice House, Oscar Petersen and Kraftwerke are among the groups that use the ST in the production of their music and/or albums. I have also seen the Atari name listed among the credits of a few films, specifically under music.

Music generation, using the ST, may be undertaken in two entirely different ways. Firstly by programming the internal sound chip. This method is used by writers of computer games to add those sounds that give realism to the game. This same sound chip, if programmed to generate musical notes, will also produce tunes of recognisable quality. To explore this area of computer usage is relatively simple and inexpensive. You can write your own programming code, using any of the available languages, to generate a series of notes, and have complete control over sound waves, envelopes, pitch, duration and so on. Or you can purchase one of a number of software programs available that utilizes the sound chip specifically to allow people interested in music to explore this area with a minimum of extra cost. Although the sound chip in the ST is not what would be termed the best thing out, it does serve the purpose of allowing a gentle introduction into music, and there are a number of relatively inexpensive music packages that cater for this need.

The second method of music generation is through MIDI. So what is MIDI? The acronym stands for Musical Instrument Digital Interface. The two MIDI ports give computer access to electronic musical instruments that allows the computer to monitor a synthesizer or any other MIDI equipped instrument. The MIDI OUT port lets the computer control an instrument's digital interface, which in turn means you can play complex compositions. The MIDI IN port accepts the signals from the synthesizer keyboard into the computer for further manipulation. By using MIDI interfaces, the ST can also become a sophisticated studio controller allowing creation of music one track at a time, up to 24 tracks, depending on the software being used.

You need to decide which area of music interests you, and chose your software with that end in mind.

Unlike general music production through the sound chip within the computer itself, MIDI use is a very specialised area. With the addition of MIDI you enter a completely different area of computer use. This is the environment of the musician, and more precisely, the courageous and creative musician. To be able to produce a complete orchestration by yourself, with absolute control over everything is wonderful when it works out well, but very frustrating when it doesn't, as you have no-one but yourself to blame!

Taking advantage

TO TAKE ADVANTAGE of MIDI you need to purchase a few more items – an electronic musical keyboard (like a piano keyboard) with MIDI capabilities, or any other MIDI interface instrument. To this you have to add two leads, a MIDI IN and a MIDI OUT. You will also need an amplifier and speakers (or headphones) plus some type of MIDI software. MIDI software tends to be more expensive than the non-MIDI musical software, and with all the various options that become available through this software it could take some time to learn how to get the most out of it. To store any extra newly generated sounds to be played within your composition you may also need to purchase cartridges that plug into your musical keyboard. If finances are tight, you may opt to store these new sounds on computer disk and download them to your synthesizer when you require them.

The excursion into the MIDI environment is not to be thought of as a one day wonder, but something that will take extra money for a number of required and necessary items, plus the time to learn how to use them with some type of proficiency. There is a wide price range for the various software packages, and in many cases the price reflects the degree of sophistication of the software. The available options that you require, and the degree of control over the process that you need, is something that you will have to decide on before purchasing your software. When you take up MIDI, what really happens is the musical keyboard and your software program are your main and essential items, the ST becomes a peripheral, a necessary one, but only a link to your main MIDI instrument.

For the beginner, a musical keyboard along the lines of the Casio CZ101 is a reasonably cheap introduction into MIDI exploration. Although the keys on the CZ101 keyboard are only half size, this would only be a problem if you're a proficient keyboard player to start with and anticipate direct playing. But for others it seems an ideal choice, given its price. The choice of software is personal, depending on what you anticipate doing. The various options can lead in any direction, you need to decide which area of music interests you, and chose your software with that end in mind.

The inclusion of MIDI ports in the Atari ST design was designed to fill a hole in the computer market – the use of computers for musical applications. And from all accounts the Atari ST has done this well – names such as Tangerine Dreams, Fleetwood Mac, Ice House, Oscar Petersen and Kraftwerke are among the groups that use the ST in music production.

For a performing musician, the ST acts as an extra pair of hands at the time of performance, where the computer has become another instrument. The concept of a 'one man band' is given new meaning with the addition of MIDI and its capabilities. By using sounds incorporated within the ST, or through an external synthesizer, you can create your own sounds by manipulating the wave forms, envelopes, duration, dynamics and so on. There are also libraries of sounds available that can be included in your work.

When creating new sounds, the ST can be used as an intelligent assistant. Think how the soft strains of rippling water could be used, or the dynamics of a strong cascading waterfall, to conjure up the emotions you want to portray in your piece of music.

Cut, copy, paste

AS WITH ANY complex environment, MIDI offers a wide variety of applications; each one a very specialised area. There are options that allow it to be used as a multi-tracked tape recorder by using sequencing programs that record all the information played on a MIDI instrument. Start by recording the actual notes played, their duration, dynamics and tempo. Continue by editing the stored information using cut, copy, paste, repeat and other functions, and then replay the piece (using the computer) in its entirety. Complete arrangements may also be recorded one part at a time, each with different sounds. This really is a 'try it and see' approach that encourages creativity, experimentation, and innovative sound combinations.

If you're not a proficient musical keyboard (piano type) player, music may be entered into computer memory note by note, whether from the musical keyboard or the computer keyboard, depending on the software you are using. This way, even the 'hunt and peck' one finger playing musician or composer can record music directly on the computer screen. With the right software the entire score can then be printed, or if required, the various individual instrument parts may be printed separately.

Now that your musical interests have been stirred up, have a look at some of the music shops carrying the Atari ST range of hardware and software to see for yourself what can actually be achieved using MIDI. It's a very powerful environment and the avenues it opens up, plus the capacity of work that can be done, is remarkable.

MIDI is essentially geared to the professional musician, but like most things in the electronic area these days, the associated costs have come down to a level that allows the interested hobbyist to investigate these new environments for their own pleasure. It's easy to see that the music of the future will have a lot to do with MIDI.

As a final comment, at the PC '89 show there was an outstanding musical education program (SoundScape). This package included the software (developed in conjunction with the Conservatorium and NSW University) and the Atari CD-ROM. It was designed specifically for use within the musical curriculum, and from what I could see and the comments I heard from practicing music teachers and musicians, it will be a forerunner to the changes of how music is going to be taught in our schools. □

PETER PHILLIPS

IIGS developments!

OK, I KNOW. It was called the Apple II developer's conference, but the IIGS was centre stage the entire time, and the 'other IIs' didn't really get a look in. Odd, you may say, when the installed base (Apple's jargon for total number) of IIes far exceeds that of the IIGS. But, I can assure you the IIGS is currently Apple's most highly supported computer and this conference, held at Manly in October 1989, was yet more proof of this. Printing lead times mean you don't get to read about it till January 1990, but better now than never! Here's an overview of the conference, as well as a brief look at some locally produced, commercially available IIGS products that were on show.

The conference was for developers only, and around 60 such individuals paid their money to attend the two day event. They came from Sydney, Perth, Melbourne, Queensland and Canberra. Apple Australia organised the event, and were able to convince Apple Inc. (USA), to send three of their front liners to present talks to the group. The conference was mainly that ... talks and presentations, by both the US visitors and local developers. I attended, as a developer, presenter and reporter, and came away more enthused about the IIGS than ever before. The Apple magic is far from dead – in fact I got the clear impression that the excitement of the early days is returning, evidenced to some extent by the presence of a number of very young developers.

Straight from the Apple core!

ALTHOUGH ALL sessions were interesting, the most awaited were those presented by the US visitors – information that was given without hype, but with much humor, intelligence and honesty. These guys knew what they were on about and didn't mind sharing it. There were many highlights and I'll try and condense them.

The first speaker was Jonathon Fader, Manager of the Education and Multimedia Evangelism Group. It seems, according to Fader, that Apple is experiencing very little competition from the IBM Dos stable when it comes to computers in education. At least in the US the trend is clear, Apple IIe and IIGS computers are in schools covering kindergarten to Year 12, with Macintosh systems in higher learning institutions.

And Apple aren't about to let go of this. They recognise the seeding potential of this strategy, in which today's students become tomorrow's Apple devotees. But to ward off the competition, Apple has several plans of attack, including concentrating on making the Mac and the IIs far more interactive. A complete networking system was established at the conference, using a Mac as the 'server' and some eight IIGS computers as the 'stations', all interconnected using Appletalk. I used it to download programs, install programs on the server, and to just get the feel of the system. Like all networked systems, it was slower than stand-alone, but it was reliable and easy to use with its mouse driven desktop interface. In fact, it was not much different to stand-alone, except for the presence of the server icon, which acted just like another drive.

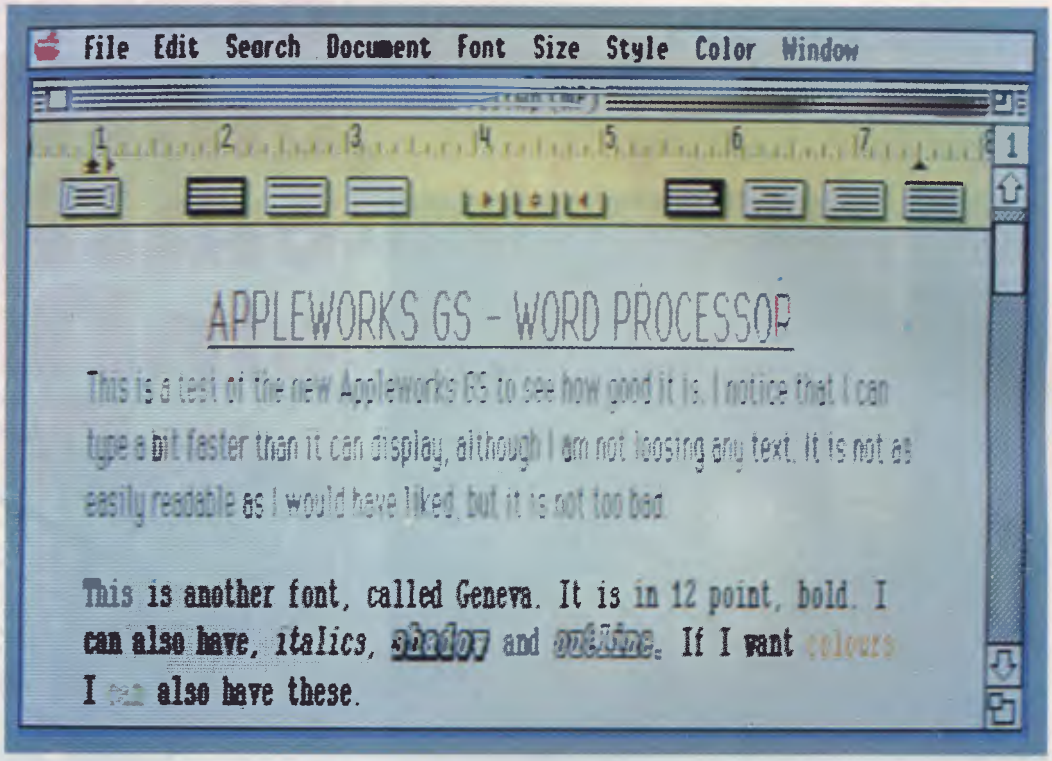
Also attending the conference were developers from an Australian company (whose name I forgot to record, unfortunately) who are presently marketing an alternative system to Appletalk. Their system is currently in contract for Australian schools, and they also export their system to the US. Both systems are compatible, and now that the move is on for 'network' friendly software, we can expect to see networking in schools become even more popular. One interesting thing I discovered is that Appleworks classic is so network unfriendly, Apple convinced Claris to write a special version suitable for networking. This product is only available for such systems, and comes with a site license and all the necessary enhancements.

But hardware is one thing, software is the other. Apple's main push is for more and more educational software, but written to take advantage of the IIGS. In the States, many schools are updating to the IIGS as their II plus, IIe and IIc computers finally fall victim to student overload. And schools in the US have no more money than those in Australia it seems. Fader made the point that such purchasers generally want a system that costs the minimum but lasts forever. In support of the costing, he referred to the new IIGS, with its onboard 1.125M of RAM, in-

In the US, Apple IIe and IIGS computers are in schools covering kindergarten to Year 12, with Macintosh systems in higher learning institutions. Apple Australia are also developing this market. They recognise the seeding potential of this strategy, in which today's students become tomorrow's Apple devotees.

creased ROM, and other enhancements. This computer still costs the same as the old IIGS, which came with only 256K of RAM.

During the Q and A session, I asked what Apple was doing to support third party printers, as I've always maintained the Imagewriter printer is overpriced when compared to other printers that will often outperform the Apple product. The answer was encouraging: Apple have now made available full details of their printer driver requirements, and will support any individual or printer manufacturer who wants to write a driver routine to support a particular printer. I believe that as a result, we will soon see drivers that support printers such as the HP range (DeskJet and so on), and all the various Epson types (over those already supported) as well as a range of others.



Ray Montagne and Matt Deatherage, both design engineers associated with the IIGS, spoke at the developer's conference on System 5.0 (we don't call it GS/OS 5 anymore), and also handed out copies of System 5.0.2. The new system cleans up a few bugs that crept into System 5.0, but doesn't offer any further speed enhancements. Their aim was to acquaint Australian developers with System 5.0, Appletalk, tool revisions, other innovations, and to answer questions.

One potentially embarrassing question asked of Fader referred to the desirability of raising school students on Apples knowing they would be more likely to encounter MS-Dos machines in the work place. He replied that this was not perceived as being a problem by most educational institutions in the US, and that the Mac was becoming an industry standard. Because of its Mac-like qualities, the cheaper IIGS with its color and sound enhancements thrown in, was seen by schools as being the best way to go, particularly when most of the previously purchased Apple software would still run.

From the IIGS designers

THE OTHER TWO US visitors were Ray Montagne and Matt Deatherage, who are both design engineers associated with the IIGS. These two 'gods' spoke about System 5.0 (we don't call it GS/OS 5 anymore), and also handed out copies of System 5.0.2. The new system cleans up a few bugs that crept into System 5.0, but doesn't offer any further speed enhancements. But then, System 5.0 is a hard act to follow.

Their aim was to acquaint Australian developers with System 5.0, Appletalk, tool revisions, other innovations, and to answer questions. As well, they had a lot to say about Apple's philosophy on software development. The big push is for Appletalk 'aware' software, as well as the adherence to the human interface guidelines. This latter concept refers to the use of the desktop and to making all software look similar, so that users don't need to spend unnecessary time learning new software.

Sophisticated software is now within everyone's reach.

Much of the talk presented by these two experts was of a technical nature and I'll spare you the details. It's sufficient to say that Apple see software developers as being very important, whether in Australia or overseas. For example, System 5.0 includes a number of resource files, specifically for programmers and a whole session was spent on this topic.

Although many of the developers were from professional organisations, a number of young developers also attended. One young programmer (16 years old) showed me a game he had written that included high quality, interrupt driven sound. He wrote the program with a combination of Basic and assembler subroutines, using the monitor to write much of the assembler code. The game was mouse operated and in full color, even though the software looked a bit like IIe code. What he had achieved would have been impossible on any other Apple II computer, and he had happily mastered the IIGS by building on experience gained from his IIe days.

The fundamental philosophy behind writing a program for the IIGS is to use the

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Graphix Exchange was written by local developer John Maclean and handles any type of graphics you can think of, with the ability to convert from one form to another. For example, a standard 320 super-resolution graphic from a GS paint program can be converted to a Print Shop graphic and vice versa. It also includes scaled transfers, which allow a composite graphic to be constructed from a number of individual graphics from a range of sources.

toolbox. Here you have all the routines to perform most of the heavy duty tasks, and a program in its simplest form is nothing more than a series of toolbox calls. In other words, Apple have done all the hard work for you, and with a few books – available from AAPDA, 36 Victoria St, Erskineville 2043 NSW, (02) 550 5533).

Local products

QUITE A NUMBER of those attending had already produced products for the IIGS, including three enterprising members of a Queensland based company called Power Up Technology. I was shown their IIGS stereo card which includes all the hardware to couple sound into as well as out of the IIGS. This card, compatible with any program that uses the Supersonic card, is available for around $89, and gives stereo output, if the software supports stereo. By the way, the new IIGS is not stereo, despite what you may have been told.

While on the subject of sound, several music programs yet to be released were demonstrated at the conference. Both programs were of the playback variety, and believe me, you 'ain't heard nuthin' yet.' There's two reasons for this – programmers are starting to learn the sound system, and the sound tools have been improved.

On the software scene, developers have been active since the IIGS first hit the country. Readers may be familiar with Graphix Exchange, a program written by local developer John Maclean that handles any type of graphics you can think of, with the ability to convert from one form to another. For example, a standard 320 super-resolution graphic from a GS paint program can be converted to a Print Shop graphic and vice versa. It also includes scaled transfers, which allows a composite graphic to be constructed from a number of individual graphics from a range of sources. A great program for handling graphics on the IIGS, and straight of Oz!

Power Up Technology gave me a review copy of their recently released communications software package called DataWorks. This program is text based and runs on the IIe and IIc as well as the IIGS, requiring keyboard operation rather than mouse. However, it supports the IIGS hardware, such as the modem port and, runs under ProDos.

I ran the program through all its paces, and found it very easy to use and free of any nasties. It supports ASCII, Xmodem, Ymodem and Binary 2 file transfer protocols. Binary 2 is a protocol developed by Apple, based around the Xmodem system and is generally used when transferring data between two Apple computers. DataWorks also supports Viatel, though with some limitations. The manual is one Power Up can be proud of, as it provides instructions to a level that suits a beginner without becoming patronising. DataWorks should be available through most dealers, at around $89. Otherwise, try them direct at PO Box 295, Cannon Hill 4170 Qld, (07) 395 6719.

Finally, a shareware program, written by a Victorian developer, Peter Watson. Under the title of PAW, the disk has a number of utilities for use with the Apple Programmers Workshop (APW) or ORCA/M, both of which are assembler programs for the IIGS. Some of the utilities also run under ProDos and others are for use with Applesoft and GSBasic. The utilities include routines to compare text files, an Applesoft to GSBasic conversion, and one called MassFormat, which allows the user to format a whole lot of 3½ inch disks in minimum time. The disk is a mere $25, or $10 if you don't want the source code. Great value, and it's available from Peter Watson, 33 Eram Rd, Box Hill North 3129 Vic.

There were other developers at the conference with products nearing completion which I hope to be able to review when they are released. So not all IIGS software/hardware is imported, which is good news for us and the national debt. □

JOHN HEPWORTH

Batch of programs

MOST PC USERS are programmers. Big statement? Want to dispute it? Well think about this – almost all PC Users will from time to time write a batch file, even if it is only a small modification to an existing AUTOEXEC.BAT file. Batch files are a list of commands for a computer to execute automatically and in sequence. By any definition they are programs.

Unfortunately Dos, the environment in which batch files are created and run, only has a very limited range of commands and possibilities. Writing powerful batch files, with the internal Dos batch commands, is very difficult due to the limited range of commands. As a result, a host of programmers have created little utility programs that can be called from batch files to achieve many desired results.

Three interesting little programs to enhance your batch files are Iff, Paws and Box. Iff reads a keystroke, or looks at a specified drive, disk or file. It sets the Dos errorlevel to a value dependent on the key that was pressed, and the batch file can then branch to various options depending on the errorlevel. Paws replaces the bland Dos Pause command, which merely says 'press any key to continue' and allows far more attractive and attention-getting messages. Box simply reads a brief text file, and displays it on the screen with a border, and user choice of the foreground and background color.

Iff

MOST USERS will have seen a simple Ask program, the sort of thing that displays a prompt to the user and accepts a keystroke. Typically, these will only accept a Yes or No answer and set the Dos errorlevel variable to 1 for No, and 0 for Yes. The built-in Dos command, IF ERRORLEVEL, then branches to different lines in the batch file depending on the errorlevel.

Iff is a much enhanced Ask command. It is invoked with various options. Depending on the one selected, it can look for a simple Yes or No response, a numeric response, an alphanumeric response, for existence of one or more files, for open floppy drives, unformatted disks, and for the free space on a disk. It then sets the Dos errorlevel to various values, and as already mentioned, the batch file can then branch depending on the errorlevel.

The simplest option is Q for Query. When Iff is invoked with this option, and a message, the message is displayed and Iff waits for a Yes or No answer, setting the errorlevel to 20 for a No answer, and 0 for a Yes answer. The M (Menu) option reads a text file containing text for a screen to be displayed, and shows it on the screen. It then waits for an alphanumeric response from a specified range. The P (Prompt) is another variation on this basic theme. It allows a message to be displayed, and for batch file author to set a range of acceptable responses.

Three options look for files in different ways. The simplest is E (Exist) which looks for an explicit file in a specified directory, without wildcards. The errorlevel is set to 99 if the door is open, 89 if the disk is not formatted, 20 if the file is not found, and 0 if the file is found. C (sCan) looks through all directories on a specified drive for the desired file. It sets the same errorlevels as the E option, but when a file exists, it changes the default directory to the one containing the file.

The final option is S (Size). Imagine you need 100K on a disk before the next action in the batch file. Invoke Iff with the parameters S d: 100. Iff will then look at the disk, and display a message showing the desired free space and the actual free space found. The errorlevel is set to 99 if the door is open, 89 if the disk is not formatted, 79 if there is inadequate free space, and 0 if there is enough free space.

Iff version 3.0 is a product of John Knauer, Jr, 6 Horseshoe Dr, Brookfield, Conneticut, USA. License fees are required only from commercial or government users.

Box

BOX IS A very simple program. It merely reads a text file and displays it on screen with user-specified foreground and background color, and a border around it. The height of the box depends on the number of lines in the text files, and the box width is set by the longest line in the file.

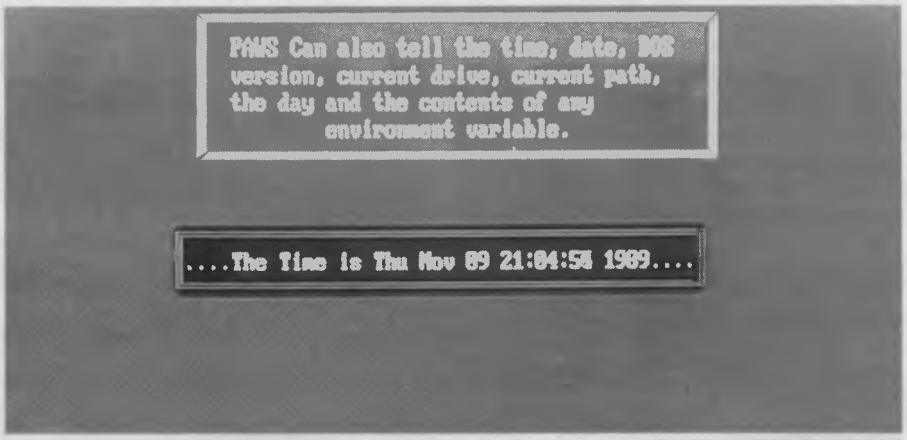
The box has a shadow to the right and

The Box program displaying a text file. Other options include the ability to display the message for a defined number of seconds, and then restore the former screen.

bottom, and defaults to being centered top-to-bottom and left-to-right, though the position for the top left corner can be set. Other options include the ability to display the message for a defined number of seconds, and then restore the former screen.

While Box is very useful, and has very attractive displays, it is not perfect. If the text file has more than 23 lines, or any line is over 77 characters long, it aborts with an error message. It would be preferable if long lines were truncated, and the first few lines of a long file were shown. It would also be nice if a message could be displayed in the top of the box surround. Finally, an option to wait for a key before terminating and restoring the screen, preferably setting the errorlevel at the same time, would be welcome. Maybe in the next version?

Box is a product of Sector One, PO Box 588, Burwood 2134 NSW. Registration is $13.



The Paws program can display an environment and other variables such as date and time.

Paws

THE TRADITIONAL way to pause a batch file until the user strikes a key is to use the Dos Pause command. This displays the message 'Press any key to continue', but suffers from some deficiencies. Not the least is that the message is not very striking in appearance and can be overlooked. It's usually quite hard to phrase a message that precedes the Pause command and still makes sense.

While Box is very useful, and has very attractive displays, it is not perfect.

Paws replaces the Dos Pause command, and allows the user (or batch file author) to specify the message to be displayed. If that was all, what a yawn, but Paws has many features and options. Firstly, it displays a line of dots 8 characters longer than the message. The message then scrolls across this row of dots from right to left, pausing briefly at the middle, with the whole process repeating until a key is pressed. At the user's option, the message can be displayed in the middle of the row of dots without moving.

The motion alone is a great improvement on the Dos Pause as it really does get the user's attention, but Paws has a vast range of options which are invoked via switches on the command line. The first option is to have a border around the message in one of 16 styles, with different combinations of single or double lines at the top, bottom, left or right sides. The colors for the message, dot-line, and borders can be independently selected from a range of 255 combinations of foreground, background, intensity and blink.

The other options? As mentioned before, a user can define the text for the message, and it isn't limited to simple ASCII text, but can include a vast array of data. Date and time variables can be displayed, including the system time and date in various formats, the number of days since the start of the year or month, number of seconds since midnight, the name of the month, day of the week, and if it is morning, afternoon or evening. Other variables include the current drive or directory, the contents of any environment variable or the Dos version, and finally, the free space on the default drive in bytes, clusters, or as a percentage of the total space on the disk.

Normally, the message is defined on the command line, but a default message can be set in an environment variable called Paws. As with the text message on the command line, this can include ASCII text, plus assorted variables and switches to invoke the various options, and can be added to, or, over-ridden by a message on the command line.

Finally, for those who want to use Paws in a batch file to take a keystroke, and set the errorlevel to allow for conditional branching in a batch file, the /K switch allows the user to define which keys Paws reads before execution of the batch file continues. A list of up to 100 characters can be used, and the errorlevel is set to the ASCII value of the upper case version of the key that is pressed.

Other switches allow Paws to clear the screen and display the message centered top to bottom and left to right, and a further option associated with this option, calls for Paws to memorise the screen before it is cleared, and restore as Paws terminates. The Paws /E switch will run a program, or execute a Dos command, and then display a user defined message and pause until a key is pressed. Other switches give beeps of user-defined pitch or pause for a defined time, and in the latter case, if a key is pressed before the time has elapsed, a different errorlevel is set to what would be set if the full time had passed.

The possibilities that Paws offers the batch file author are dramatically displayed in a sample batch file about 300 lines long that comes with the package. It shows not only how to use various Paws options, but is a lesson in itself on writing batch files.

Paws version 2.1 is a product of Michael Wilson of Longmont, Colorado, USA. The contribution sought from users is either $2, or a disk of the user's favorite public domain software!

Availability

I GOT MY copies of Iff, Box and Paws from a local bulletin board in the files Iff.LZH, Box.LZH and Paws21. Look for them on a board near you, possibly in archive files with .ARC or .ZIP extensions instead of .LHZ. □

SERVICES PAGE

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